Name:_____ Class:_____ Date:_____

Chapter 2 - Wireless Data Transmission

1. All forms of electromagnetic energy travel through space in the form of particles.
   a. True
   b. False

ANSWER: False

2. Infrared light is highly susceptible to interference from other sources of light.
   a. True
   b. False

ANSWER: False

3. The height of a radio wave is called the amplitude of the wave.
   a. True
   b. False

ANSWER: True

4. Spread-spectrum signals are more susceptible to outside interference than narrow-band transmissions.
   a. True
   b. False

ANSWER: False

5. Hopping codes used in FHSS transmissions are configured on the base station by the network administrator.
   a. True
   b. False

ANSWER: False

6. Which of the following is true about wireless radio signal transmissions?
   a. they travel at the speed of light
   b. they require an atmosphere to move
   c. they travel as discrete particles
   d. they require visible light

ANSWER: a

7. Which of the following is NOT true about infrared light?
   a. it can be used in directed transmissions
   b. it can be used in diffused transmissions
   c. it is less susceptible to interference from visible light sources
   d. all infrared signals are invisible

ANSWER: d

8. Which of the following transmits a signal in an infrared device?
   a. diffuser
   b. emitter

Chapter 2 - Wireless Data Transmission

c. detector
d. antenna

ANSWER: b

9. Which of the following is NOT a limitation of using infrared wireless systems?
a. they lack mobility
b. they use a line-of-sight principle
c. someone can easily eavesdrop from another room
d. diffused transmissions have a range of 50 feet

ANSWER: c

10. Which of the following is a good application for an infrared wireless system?
a. stream movies from a server
b. wireless outdoor speakers
c. whole house wireless network
d. data transfer between laptop and camera

ANSWER: d

11. Which best describes an analog audio signal?
a. it starts and stops while the sound is playing
b. intensity varies and is continuous
c. consists of discrete pulses
d. Morse code is an example

ANSWER: b

12. What process must occur to transmit a digital signal over an analog medium?
a. modulation
b. decoupling
c. decoding
d. emitting

ANSWER: a

13. What is the distance between a point in one wave cycle and the same point in the next wave cycle?
a. amplitude
b. wavelength
c. carrier
d. frequency

ANSWER: b

14. The frequency of a wave is best defined as which of the following?
a. encoding of bits onto an analog wave

Chapter 2 - Wireless Data Transmission

b. the voltage difference between the peak and trough of the wave
c. a carrier wave that has been modulated
d. the number of times a cycle occurs each second

ANSWER: d

15. What is the unit of measurement for radio frequency?
a. volt
b. rpm
c. Hz
d. amp

ANSWER: c

16. What is the role of an antenna on a wireless device?
a. it helps tune to a frequency
b. it demodulates a signal
c. it serves as a ground signal
d. it transmits and receives data

ANSWER: d

17. Which of the following is true about baud rate?
a. only one bit can be transferred per signal unit (baud)
b. multiple bits can be transferred with each signal unit
c. a baud rate of 2400 always means a bandwidth of 2400 bps
d. multiple signal units are needed to represent each bit

ANSWER: b

18. Which of the following best describes bandwidth in an analog system?
a. the range of frequencies that can be transmitted by a system
b. the number of bits transmitted per second
c. the number of bytes transmitted per minute
d. the maximum frequency supported by the medium

ANSWER: a

19. Which of the following is NOT a type of modulation that can be applied to an analog signal?
a. phase
b. carrier
c. frequency
d. amplitude

ANSWER: b

20. Which type of radio signal is most susceptible from interference sources such as lightning?

Chapter 2 - Wireless Data Transmission

a. AM
b. FM
c. PM
d. DM

ANSWER: a

21. Which of the following is NOT an advantage of digital modulation over analog modulation?
a. better use of bandwidth
b. requires less power
c. better performance during interference
d. less sophisticated

ANSWER: d

22. Which binary signaling technique reduces the voltage to zero before the end of the period for transmitting a 1 bit?
a. NRZ-L
b. NRZ-I
c. RZ
d. NRZ

ANSWER: c

23. Which binary modulation technique employs NRZ coding such that the absence of a carrier signal represents a 0 bit?
a. ASK
b. BPSK
c. FSK
d. PSK

ANSWER: a

24. Which radio transmission method uses a chipping code?
a. FM
b. FHSS
c. DSSS
d. AM

ANSWER: c

25. Which of the following is a spread spectrum technique that employs mathematical algorithms to recover lost data bits?
a. frequency hopping
b. direct sequence
c. narrow band

d. wide band

ANSWER: b

26. What do data signals on a wireless communication system travel on?
a. fixed frequencies
b. electromagnetic waves
c. digital radiation
d. alternate current

ANSWER: b

27. What type of signal is broadcast as a continuous wave?
a. LAN
b. digital
c. Ethernet
d. analog

ANSWER: d

28. A wave that is composed of one top and one bottom peak has completed which of the following?
a. amplitude
b. hertz
c. pitch
d. cycle

ANSWER: d

29. Which non-return-to-zero encoding method represents a 1 bit by increasing voltage to a positive value and a 0 bit by decreasing the voltage to a negative value?
a. RZ
b. NRZ-I
c. polar
d. ASK

ANSWER: c

30. In PSK, what is the technique of combining amplitude and phase modulation called?
a. constellation
b. QAM
c. FHSS
d. hopping

ANSWER: b

31. Describe the components in an infrared wireless system.

ANSWER: Infrared wireless systems require that each device have two components: an emitter, which transmits a signal, and a detector, which receives the signal. (These two components are almost always combined into one

device.) An emitter is usually a laser diode or a light emitting diode (LED). Infrared wireless systems send data by the intensity of the light wave instead of whether the light signal is on or off. To transmit a 1, the emitter increases the intensity of the electrical current and, consequently, the intensity of the infrared light, which indicates a pulse to the receiver. The detector senses the higher-intensity pulse of light and produces a proportional electrical current

32. What are the advantages and limitations of an infrared wireless system?

ANSWER: Infrared wireless systems have several advantages. Infrared light neither interferes with other types of communications signals (such as radio signals) nor is it affected by other signals, except light. In addition, because infrared light does not penetrate walls, the signals are kept inside a room. This makes it impossible for someone elsewhere to listen in on the transmitted signal.

However, there are several serious limitations to infrared wireless systems. The first limitation involves the lack of mobility. Directed infrared wireless systems use a line-of-sight principle, which makes it challenging for mobile users because the alignment between the emitter and the detector would have to be continually adjusted. The second limitation is the range of coverage. Directed infrared systems, which require line of sight, cannot be placed in an environment where there is the possibility that anything could get in the way of the infrared beam (think of someone standing in front of your remote control while you are trying to change TV channels). This means that devices using infrared transmissions must be placed close enough to one another to eliminate the possibility of something moving between them. Due to the angle of deflection, diffused infrared can cover a range of only 50 feet (15 meters). And because diffused infrared requires a reflection point, it can only be used indoors. These restrictions limit the range of coverage.

Another significant limitation of an infrared system is the speed of transmission. Diffused infrared can send data at maximum speeds of only 4 Mbps. This is because the wide angle of the beam loses energy as it reflects. The loss of energy results in a weakening signal. The weak signal cannot be transmitted over long distances, nor does it have sufficient energy to maintain a high transmission speed, resulting in a lower data rate.

33. Contrast analog signals with digital signals.

ANSWER: An analog signal is one in which the waves vary continuously-in other words, the waves have no breaks in them. A digital signal consists of discrete or separate pulses, as opposed to an analog signal, which is continuous. A digital signal has numerous starts and stops, on and off-like Morse code, for example, with its series of dots and dashes.

34. Describe how digital signals are transmitted over a telephone line or TV cable.

ANSWER: To transmit a digital signal over a telephone line or TV cable, which are analog media and were not designed to carry a purely digital signal, a device known as a modem (MOdulator/DEModulator) is used. A modem takes the distinct pulses of electricity that make up digital signals from a computer and encodes them onto a continuous analog signal for transmission. The process of encoding the digital signals (bits) onto an analog wave is called modulation. The modem at the other end of the connection then reverses the process by receiving an analog signal, demodulating it, which means extracting the bits from it, to convert them back into a digital signal.

35. How are radio waves transmitted using an antenna?

ANSWER: Radio waves are usually transmitted and received using an antenna. An antenna is a length of copper wire, or similar material, with one end free and the other end connected to a receiver or transmitter. When transmitting, the radio waves created by the electronic circuit of the transmitter are fed to this antenna wire. This sets up an electrical pressure (voltage) along the wire, which will cause a small electrical current to flow into the antenna. Because the current is alternating, it flows back and forth in the antenna at the same frequency as the radio waves. When the electricity moves back and forth in the antenna at the same frequency as the radio waves, it creates both a magnetic field and an electrical field around the antenna. This continuous (analog) combination

Chapter 2 - Wireless Data Transmission

of magnetism and electrical pressure moves away (propagates) from the antenna the same way that water waves move away from the point of impact when you throw a rock in a pond. The result is an electromagnetic wave (EM wave).

36. What are the three types of modulation that can be applied to an analog signal to enable it to carry information?

ANSWER: The height of the signal, the frequency of the signal, and the relative starting point, or phase, of the signal.

37. Describe amplitude modulation.

ANSWER: The height of a wave, known as the amplitude, can be measured in volts (electrical pressure). In amplitude modulation (AM), the height of the wave is changed in accordance with the height of another analog signal, called the modulating signal. In the case of an AM radio station, the modulating signal is the voice of the announcer or the music, which is also an analog signal. The carrier wave's frequency and phase remain constant.

38. Describe the NRZ technique of representing bit signals.

ANSWER: With nonreturn-to-zero, the voltage of the signal does not change for the entire length of the bit period. When the next bit to be transmitted has the same binary value as the previous bit, the signal does not change, remaining high for a 1 and low (0 volts or no voltage) for a 0.

39. What is phase shift keying? Describe how it works.

ANSWER: Phase shift keying (PSK) is a binary modulation technique, similar to phase modulation, in which the transmitter varies the starting point of the wave. The difference between PSK and phase modulation is that the PSK transmission starts and stops, because the signal being encoded onto it is binary.

40. How are bits transmitted using DSSS? Include the chipping code in your answer.

ANSWER: DSSS uses an expanded redundant code to transmit each data bit and then a modulation technique such as quadrature phase shift keying (QPSK). This means that a DSSS signal is effectively modulated twice. Instead of simply encoding these two bits over a carrier wave for transmission, the value of each data bit is first added to each individual 1 and 0 in a sequence of binary digits called a Barker code. A Barker code (or chipping code) is a particular sequence of 1s and 0s that has properties that make it ideal for modulating radio waves as well as for being detected correctly by the receiver. These 1s and 0s are called chips instead of bits to avoid confusing them with the actual data bits. The chipping code is sometimes called a pseudorandom code because it is usually derived through a number of mathematical calculations as well as through practical experimentation.

Match each item with a statement below.

a. ASCII

b. amplitude modulation

c. analog signal

d. baud rate

e. carrier wave

f. digital modulation

g. frequency modulation

h. hopping code

i. NRZ

Name:_____ Class:_____ Date:_____

Chapter 2 - Wireless Data Transmission

j. PM

41. an arbitrary coding scheme that uses the numbers from 0 to 127 to represent alphanumeric characters and symbols
ANSWER: a

42. a technique that changes the height of a carrier wave in response to a change in the height of the input signal
ANSWER: b

43. a signal in which the intensity varies continuously and smoothly over a period of time
ANSWER: c

44. the number of times that a carrier signal changes per second
ANSWER: d

45. an analog wave having a frequency that a receiver is tuned to
ANSWER: e

46. a method of encoding a digital signal onto an analog carrier wave
ANSWER: f

47. a technique that changes the number of wave cycles in response to a change in the amplitude of the input signal
ANSWER: g

48. the sequence of changing frequencies used in FHSS
ANSWER: h

49. a binary signaling technique that increases the voltage to represent a 1 bit but provides no voltage for a 0 bit
ANSWER: i

50. a technique that changes the starting point of a wave cycle in response to a change in the amplitude of the input signal
ANSWER: j