

Chapter 1

Review Questions

1. Ultra Wide Band transmission technology is used primarily for _____.
 - a. displaying webpages on a cellular phone
 - b. connecting devices installed close together at very high speeds
 - c. finding the location of a car within a city
 - d. transmitting data at distances of up to 35 miles
2. Bluetooth devices communicate using small radio transceivers called _____ that are built onto microprocessor chips.
 - a. receivers
 - b. transponders
 - c. radio modules
 - d. link managers
3. ZigBee devices transmit data at rates of up to _____.
 - a. 250 kbps
 - b. 1 Mbps
 - c. 721.3 kbps
 - d. 3 Mbps
4. IEEE 802.11n equipped devices can be as far as 375 feet (114 meters) apart and can send and receive data at rates over _____ Mbps, according to the IEEE standard.
 - a. 75
 - b. 600
 - c. 100
 - d. 54
5. Each Bluetooth device uses a _____, which is a special software that helps identify other Bluetooth devices.
 - a. frame
 - b. link manager
 - c. repeater
 - d. bridge
6. Bluetooth can send data through physical barriers, like walls. **True** or False?
7. Bluetooth devices can transmit at maximum data at rates 75 Mbps. True or **False**?
8. A wireless network interface card performs basically the same functions and looks similar to a traditional network interface (NIC) card. **True** or False?
9. An Earth station transmits to a satellite at one frequency, and the satellite regenerates and transmits the signal back to Earth on the same frequency. True or **False**?
10. Eliminating cable installation costs is an advantage of a wireless technologies. **True** or False?
11. The automatic connection between various Bluetooth devices creates a network called a(n) _____.
 - a. micronet
 - b. small net
 - c. piconet

- d. Intranet
- 12. 4G (fourth generation) cellular technology allows data connections at a maximum rate of over _____ in fast-moving vehicles.
 - a. 2 Mbps
 - b. 1 Gbps
 - c. 20 Mbps
 - d. 100 Mbps
- 13. An 802.11 wireless NIC, when configured to communicate with a wired network, sends its signals through invisible radio waves to _____.
 - a. another computer directly
 - b. an access point
 - c. a wireless server
 - d. the Internet
- 14. _____ is a wireless technology that can be used for data communications and transmit as far as 35 miles.
 - a. Wi-Fi
 - b. Microwave
 - c. WiGig
 - d. WWAN
- 15. How can a ZigBee network be extended beyond its maximum range?
 - a. By using network cables
 - b. It can't, you would have to use Wi-Fi or another kind of wireless network.
 - c. ZigBee devices can pass information through to other devices.
 - d. By installing a ZigBee AP
- 16. Explain the role of an access point (AP) in a WLAN. **APs connect wireless networks to the wired infrastructure (or network).**
- 17. Describe the difference between WPANs, WLANs, WMANs, and WWANs with a single word. **Distance or range.**
- 18. What could you use a WLAN for, in a classroom setting? **For Internet access, to display the class presentation content, to allow students to answer short quizzes, and a large number of other uses.**
- 19. Pick one of the types of wireless networks described in this chapter, and describe how it can reduce installation time. **Wi-Fi dramatically reduces or completely eliminates the need for installing and routing cables. It also allows for desks to be moved without the need for moving the cabling infrastructure.**
- 20. Write a paragraph about how implementing a wireless network can be helpful in case of disaster recovery. **Answers will vary.**

Chapter 2

Review Questions

- 1. Which range of the electromagnetic spectrum is less susceptible to interference from sources of visible light?
 - a. ultraviolet

- b. gamma light
 - c. **infrared**
 - d. yellow light
2. The distance between one positive peak and the next positive peak of a wave is called _____.
- a. frequency
 - b. **wavelength**
 - c. elasticity
 - d. intensity
3. Which type of transmission is used when human voice is modulated directly onto a carrier wave?
- a. **analog**
 - b. digital
 - c. diffused
 - d. directed
4. Why do computers and data transmission equipment use binary?
- a. **They are electrical devices, and electricity has only two states.**
 - b. Base 2 is too difficult to use.
 - c. Base 10 was developed before binary.
 - d. Binary is the next step beyond quadecimal.
5. Eight binary digits grouped together form which of the following?
- a. **byte**
 - b. bit
 - c. binary
 - d. 2x quad
6. The American Standard Code for Information Interchange (ASCII) can represent up to 1024 characters. True or **False**?
7. Letters of the alphabet and symbols are stored using the ASCII code, but not numbers used in calculations. **True** or False?
8. Infrared light, though it may be invisible, has many of the same characteristics of visible light. **True** or False?
9. Infrared wireless systems require that each device needs to have only one component: either an emitter that transmits a signal or a detector that receives the signal. True or **False**?
10. Infrared wireless systems send data by the intensity of the light wave instead of whether the light signal is on or off. **True** or False?
11. Infrared wireless transmission can be either directed or _____.
- a. analog
 - b. digital
 - c. **diffused**
 - d. detected
12. Radiotelephony or radio travels in waves known as _____ waves.
- a. **electromagnetic**
 - b. analog
 - c. magnetic
 - d. electrical
13. Unlike a digital signal, a(n) _____ signal is a continuous signal with no “breaks” in it.

- a. magnetic
 - b. visible
 - c. light
 - d. **analog**
14. Changing a signal to encode data onto it is known as _____.
- a. baud
 - b. demodulation
 - c. **modulation**
 - d. continuity
15. PSK is an example of _____.
- a. ASCII encoding
 - b. unicoding
 - c. phase modulation
 - d. **digital modulation**
16. Explain how a radio antenna works when transmitting a signal.
An electrical signal (current and voltage) is fed into the antenna. Because the antenna is only connected on one side to the transmitter circuit, electrical and magnetic fields develop around the antenna. As more signal is fed into the antenna, more of these fields are generated and they begin to propagate or move away from the surface of the antenna.
17. Explain the difference between bps and baud rate.
Bits per second (bps) refers to the number of data bits per second that are transmitted. Baud refers to the number of signal changes per second. Each signal change made can be encoding more than 1 bit of data.
18. Explain the difference between amplitude modulation, frequency modulation, and phase modulation.
In amplitude modulation, the height of a wave is changed in direct relationship to the modulating or input signal. In frequency modulation, the amplitude remains constant, but the frequency of the wave is changed. In phase modulation, the starting point of a wave is changed with reference to the starting point of the previous wave cycle.
19. What is quadrature amplitude modulation (QAM) and how does it work?
Quadrature amplitude modulation varies both the amplitude and phase of a wave to encode data. This creates a larger number of possible changes to a signal and therefore enables the transmission of multiple bits per change.
20. List and describe the three different types of binary signaling techniques.
Return-to-zero is when a signal is raised at the beginning of the bit time and lowered before the end of the bit time. Non-return-to-zero is when the signal remains at a voltage when subsequent bits are of the same value, either 1 or 0. Non-return-to-zero-level works the same way as non-return-to-zero but uses two polarities, positive and negative voltages, to represent a 1 or a 0.

Chapter 3

Review Questions

1. Each of the following is a type of RF filter except _____.
- a. low-pass

- b. high-pass
 - c. passband
 - d. bandpass
2. A(n) _____ combines two inputs to create a single output.
- a. mixer
 - b. codex
 - c. filter
 - d. amplifier
3. A(n) _____ actively increases a signal's intensity or strength.
- a. transmitter
 - b. demodulator
 - c. amplifier
 - d. antenna
4. The result of using a PN code is that _____.
- a. it adds a unique address to the signal
 - b. it spreads the signal over a wider range of frequencies
 - c. it mixes the signal with the IF
 - d. it decodes the signal
5. _____ is a method of transmission in which the information is broken up into smaller units.
- a. Error correction
 - b. Circuit switching
 - c. Electromagnetic interference
 - d. Packet switching
6. A passband has both a minimum and maximum threshold. True or False?
7. The resulting output from the modulation process is known as the middle frequency (MF) signal. True or False?
8. When mixing two signals, the highest sum and the smallest difference between the carrier frequency and the range of frequencies at the other input define two limits known as the sidebands. True or False?
9. TDMA can carry three times the amount of data that CDMA can. True or False?
10. Without circuit switching, 1,225 cables would be required to interconnect 50 telephones. True or False?
11. When using the same antenna for full-duplex communications, the same frequency can be used for transmitting and receiving simultaneously. True or False?

12. _____ divides the bandwidth of the frequency into several narrower frequencies. Each user then transmits using its own narrower frequency channel.
 - a. TDMA
 - b. OFDM
 - c. FDMA
 - d. CDMA
13. When signals are sent at frequencies that are closely grouped together, an errant signal may encroach on a close frequency, causing _____.
 - a. frequency conflict
 - b. crosstalk
 - c. time conflict
 - d. channel mixing
14. Which of the following divides the bandwidth of the frequency channel into several time slots?
 - a. FDMA
 - b. OFDM
 - c. CDMA
 - d. TDMA
15. A _____ transmission uses spread spectrum technology and unique spreading codes for each user.
 - a. CDMA
 - b. FDMA
 - c. TDMA
 - d. OFDM
16. List and describe the three types of data flow. Simplex is transmission in one direction only. Half-duplex is transmission in both directions, but only one at a time. Full-duplex is simultaneous transmission in both directions at the same time.
17. List the three general types of standards. De facto, de jure, and consortia.
18. What is switching in communications? What type of switching is used with telephone transmissions, and what type is used for data transmissions? Switching is the process of moving a signal from one wired or frequency to another. Telephone systems use circuit switching and data transmissions typically use packet switching.
19. Explain multipath distortion and how it can be minimized. This type of interference is caused by signals reflecting off objects such as walls and travelling a longer distance than signals moving directly from the transmitter to receiver. Because signals traveling a longer distance can arrive at the receiver out of phase with the direct signal, this causes interference and possible loss of signal strength.

20. What does the Federal Communications Commission do regarding the licensing of radio frequencies? **The FCC accepts and processes requests for use of a particular frequency band, for a particular purpose, and then may issue a license to the requesting party. There is often a cost associated with licensing and it can be very high.**

Chapter 4

Review Questions

1. Antennas are _____ devices.
 - a. powered
 - b. connection
 - c. amplification
 - d. reciprocal**
2. Decibel is a relative measurement that requires a(n) _____.
 - a. distance
 - b. antenna
 - c. power level
 - d. comparison**
 - e. gain
3. A gain of 6 dB means that the signal level or strength _____.
 - a. increases very little
 - b. doubles
 - c. doubles twice**
 - d. does not increase at all
4. A transmitter generates a 15-dBm signal and is connected to an antenna using a cable that introduce 2 dB of loss. The cable has two connectors, one at each end, that introduce a loss of 2 dB each. What is the signal level at the input of the antenna in dBm and milliwatts?
 - a. 9 dBm, 8 mW**
 - b. 10 dBm, 10 mW
 - c. 21 dBm, 18 mW
 - d. 6 dBm, 4 mW
5. The simplest and most practical type of antenna is a _____ antenna.
 - a. straight wire
 - b. dipole**
 - c. yagi
 - d. monopole
 - e. passive
6. A(n) _____ antenna transmits a signal in all directions with relatively equal intensity.
 - a. multidirectional
 - b. phased array
 - c. directional
 - d. omnidirectional**
 - e. smart

7. Between the transmitting antenna and the receiving antenna, a signal will always be subject to _____.
 - a. gain
 - b. amplification
 - c. free space loss
 - d. reflection
 - e. diffraction
8. For the best performance between transmitter and receiver, the two antennas should have the same _____.
 - a. format
 - b. angle
 - c. gain
 - d. polarization
9. In a direct, point-to-point link, the Fresnel zone should never be obstructed more than _____.
 - a. 40 percent
 - b. 60 percent
 - c. 30 percent
 - d. 50 percent
10. To work as efficiently as a dipole, a monopole antenna requires a(n) _____.
 - a. LMR cable
 - b. longer length
 - c. ground plane
 - d. amplifier
11. A lower frequency signal uses a _____ antenna, whereas a higher frequency signal uses a _____ antenna.
 - a. shorter, longer
 - b. longer, shorter
 - c. higher, lower
 - d. lower, higher
12. The gain of an antenna is the measure of how an antenna _____ the beam.
 - a. focuses
 - b. widens
 - c. enlarges
 - d. lowers
13. A directional antenna typically has a low gain. True or False?
14. Passive antennas can be designed in a way that effectively increases the strength of a signal in a particular direction. True or False?
15. The _____ of an antenna depends upon the frequency of the RF signal and the gain.
 - a. length
 - b. amplification
 - c. width
 - d. height
16. When planning an outdoors wireless link, you should always prepare a _____ to ensure that the signal that reaches the receiver meets the minimum signal strength requirements for a reliable connection.

- a. free space loss
 - b. proposal
 - c. link budget
 - d. specification
17. List two types of directional antennas. Yagi and dish or parabolic dish
18. How do smart antennas function? By detecting the direction of the signal from a mobile device and enabling an antenna element that directs most of the energy to that device.
19. How do sky waves propagate? Sky waves bounce off the ionosphere and are reflected back to the ground.
20. What happens if someone sets up a pair of antennas that interfere with your point-to-point link between two buildings, using the same unlicensed frequency channel as you do? You must reposition your antennas or they have to reposition theirs because in the case of unlicensed frequencies the regulatory authority will not provide any assistance.

Chapter 5

Review Questions

1. A Bluetooth channel consists of _____.
- a. a specific frequency channel
 - b. an IEEE 802.15.1 channel
 - c. a hopping sequence including up to 79 frequencies
 - d. a frequency range that the signal spreads across
2. Which of the following is not an example of a Bluetooth communication?
- a. smartphone phone to headset
 - b. laptop computer to smartphone
 - c. hard drive to memory
 - d. laptop computer to GPS
3. Which of the following is not a feature of Bluetooth?
- a. power-saving
 - b. master and slave changing roles
 - c. slave authenticates master
 - d. asymmetric transmission
4. What is the name of the organization that develops and promotes Bluetooth products and consists of over 14,000 hardware and software vendors?
- a. Bluetooth SIG

- b. IEEE 802.15.1 Task Group
 - c. Bluetooth TIA
 - d. Bluetooth Standards Organization
5. The lower layers of a Bluetooth WPAN protocol stack are implemented in the _____.
- a. software
 - b. hardware
 - c. IR
 - d. data link layer
6. At the lowest level of the Bluetooth protocol stack is the _____ layer.
- a. RF
 - b. L2CAP
 - c. TCP/IP
 - d. Link Manager
7. Which of the following is a feature of WPAN devices?
- a. They can transmit signals at a great distance.
 - b. They are usually small and can operate on batteries.
 - c. They transmit signals that do not penetrate walls.
 - d. Their users cannot roam.
8. The _____ is when ZigBee devices have time reserved for priority transmissions.
- a. contention access period
 - b. GTS
 - c. beacon period
 - d. time synchronization period
9. Which method of Bluetooth transmission uses two different frequencies to indicate whether the bit is a 1 or a 0?
- a. DSSS
 - b. FHSS
 - c. GFSK
 - d. DPSK