
CHAPTER 5

Analog Transmission

Review Questions

1. Digital-to-analog modulation is the conversion of a digital signal into an analog signal.
2. Analog-to-analog modulation is the conversion of an analog signal into another analog signal.
3. Amplitude modulation is more susceptible to noise.
4. QAM combines both ASK and FSK and provides many combinations of amplitude and phase. Each combination can represent more than one bit.
5. ASK, FSK, PSK, and QAM.
6. Bit rate is the number of bits transmitted during one second, whereas baud rate is the number of signal units, which can represent more than one bit, transmitted per second. In ASK both the bit and baud rates are the same. In PSK and QAM the baud rate is less than or equal to the bit rate of the signal.
7. Modulation is the process of modification of one or more characteristics of a carrier signal by an analog signal that needs to be transmitted.
8. The carrier signal is a high-frequency signal that is modulated by the information signal.
9. ASK: the bandwidth is almost equal to the baud rate.
10. FSK: the bandwidth is almost equal to the baud rate plus the frequency difference between bit 0 and 1.
11. PSK: the bandwidth is almost equal to the baud rate.
12. Amplitude and phase of each signal unit; number of bits per baud.
13. QAM: the bandwidth is almost equal to the baud rate.
14. QAM is a combination of PSK and ASK.
15. PSK is based on phase shift and therefore is less susceptible to noise.
16. Modem: modulator/demodulator.

17. A modulator converts a digital signal into an analog signal using ASK, FSK, PSK or QAM. A demodulator converts an analog signal into a digital signal; it reverses the process of modulation.
18. The downloading data rate is higher than the uploading data rate.
19. Modems transform the digital output of computers into analog form usable by telephone local loops and vice versa.
20. In FSK, some of the bandwidth is used to separate the two carrier frequencies.
21. AM is used for analog-to-analog conversion, ASK for digital-to-analog.
22. FM is used for analog-to-analog conversion, FSK for digital-to-analog.
23. The bandwidth of an AM carrier signal is twice the bandwidth of the modulating signal, whereas the bandwidth of an FM signal is 10 times the bandwidth of the modulating signal.

Multiple-Choice Questions

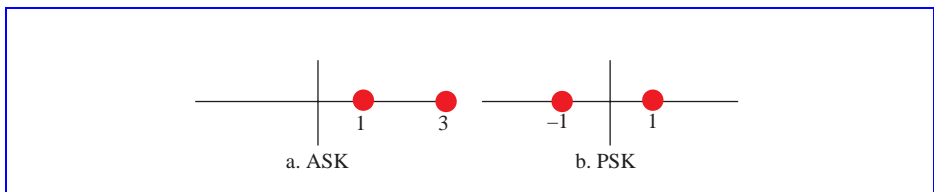
24. b
25. c
26. a
27. b
28. c
29. d
30. d
31. c
32. d
33. c
34. a
35. b
36. a
37. b
38. b
39. a
40. c
41. b
42. d
43. c
44. b
45. b
46. b
47. a
48. b
49. d

50. a
 51. a
 52. c

Exercises

53.
 a. 2000 bps
 b. 4000 bps
 c. 6000 bps
 d. 3000 bps
 e. 2000 bps
 f. 2000 bps
 g. 1500 bps
 h. 6000 bps
54.
 a. 1000 baud
 b. 2000 baud
 c. 1500 baud
 d. 6000 baud
55.
 a. 1000 bps
 b. 1000 bps
 c. 3000 bps
 d. 4000 bps
56. See Figure 5.1.

Figure 5.1 Exercise 56



57.
 a. $0.91 \times 127 = 116 \Rightarrow 01110100$
 b. $-0.25 \times 127 = -32 \Rightarrow 10100000$
 c. $0.56 \times 127 = 71 \Rightarrow 01000111$
58. It is ASK (2 amplitudes, 1 phase) with 1 bit per baud. See Figure 5.2.
 59. It is ASK (2 amplitudes, 1 phase) with 1 bit per baud. See Figure 5.3
 60. It is PSK (1 amplitude, 2 phases) with 1 bit per baud. See Figure 5.4

Figure 5.2 Exercise 58

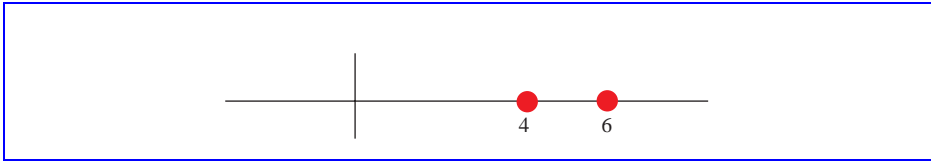


Figure 5.3 Exercise 59

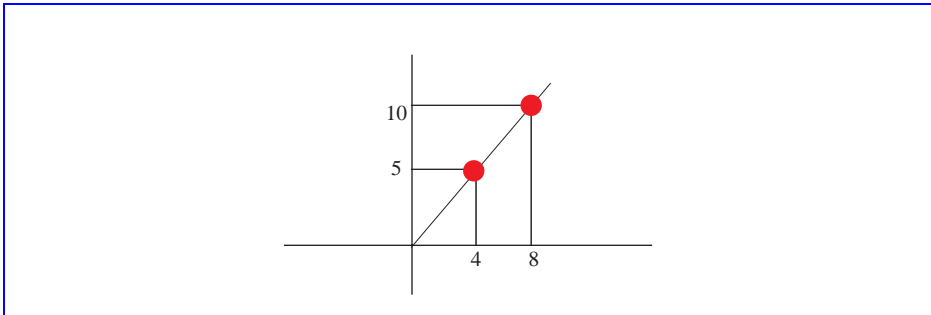
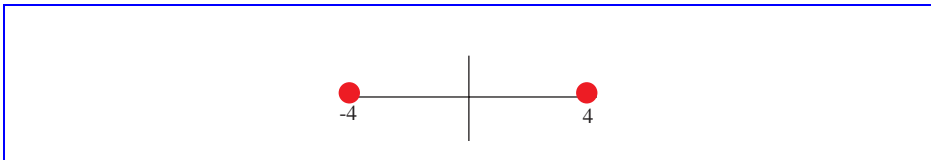
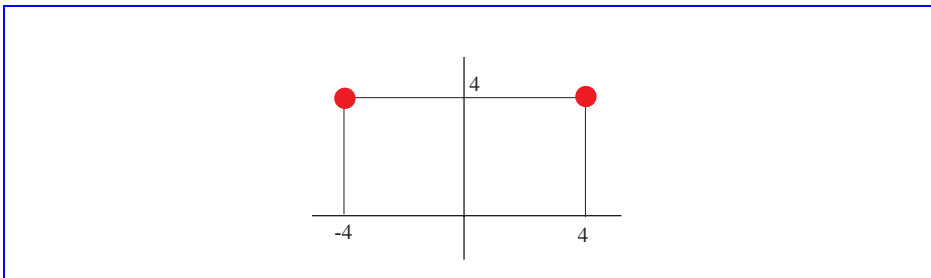


Figure 5.4 Exercise 60



61. It is PSK (1 amplitude, 2 phases) with 1 bit per baud. See Figure 5.5

Figure 5.5 Exercise 61



62. It is 4-QAM (2 amplitudes, 4 phases) with 2 bits per baud. See Figure 5.6

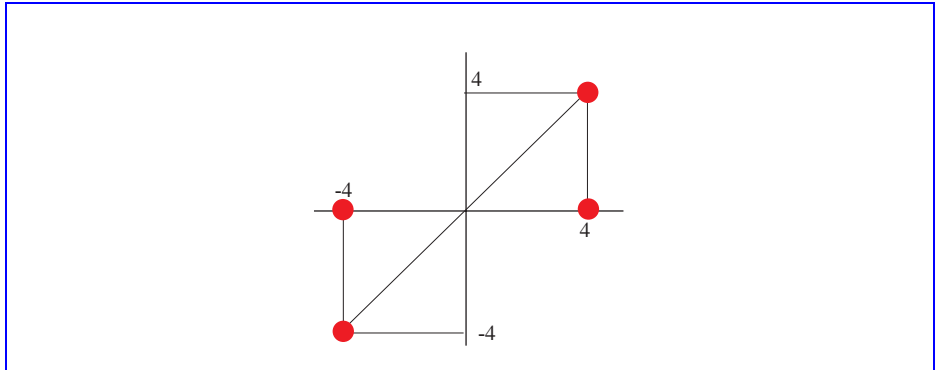
63. ASK

64. PSK

65. QAM

66. QAM

67. No, 12 is not a power of 2.

Figure 5.6 Exercise 62

68. No, 18 is not a power of 2.
69. Number of points = 2^n where n is the number of bits represented by a point
70. Three bits per baud
- 71.
- $BW = 4 \times 2 = 8 \text{ KHz}$
 - $BW = 8 \times 2 = 16 \text{ KHz}$
 - $BW = (3,000 - 2,000) \times 2 = 2,000 \text{ Hz} = 2 \text{ KHz}$
- 72.
- $BW = 12 \times 10 = 120 \text{ KHz}$
 - $BW = 8 \times 10 = 80 \text{ KHz}$
 - $BW = 1,000 \times 10 = 10 \text{ KHz}$

