
CHAPTER 4

Digital Transmission

Review Questions

1.
 - unipolar, 2
 - NRZ-L, 2
 - NRZ-I, 2
 - RZ, 3
 - Manchester, 2
 - differential Manchester, 2
 - AMI, 3
 - 2B1Q, 4
 - MLT-3, 3
3. The bit rate is always greater than or equal to the pulse rate because a pulse contains one or more bits.
5. In NRZ-L the signal depends on the state of the bit: a positive voltage is usually a 0, and the negative a 1. In NRZ-I the signal is inverted when a 1 is encountered.
7. Both methods convert digital data into digital signals. In RZ, a 1 bit is represented by positive-to-zero, and 0 by negative-to-zero, whereas in bipolar AMI a 0 is represented by a zero voltage, while 1 is represented by alternating positive and negative values.
9. If you select a code that minimizes the number of consecutive 0s or 1s, this could help in synchronization.
11. The higher the number of samples taken the more accurate the digital reproduction of an analog signal. However, there is an upper limit.
13. The Nyquist theorem says the sampling rate must be at least twice the highest frequency of the original signal.
15. Advantage: increase of transmission speed and therefore efficiency. Disadvantage: cost of multiple communication lines.

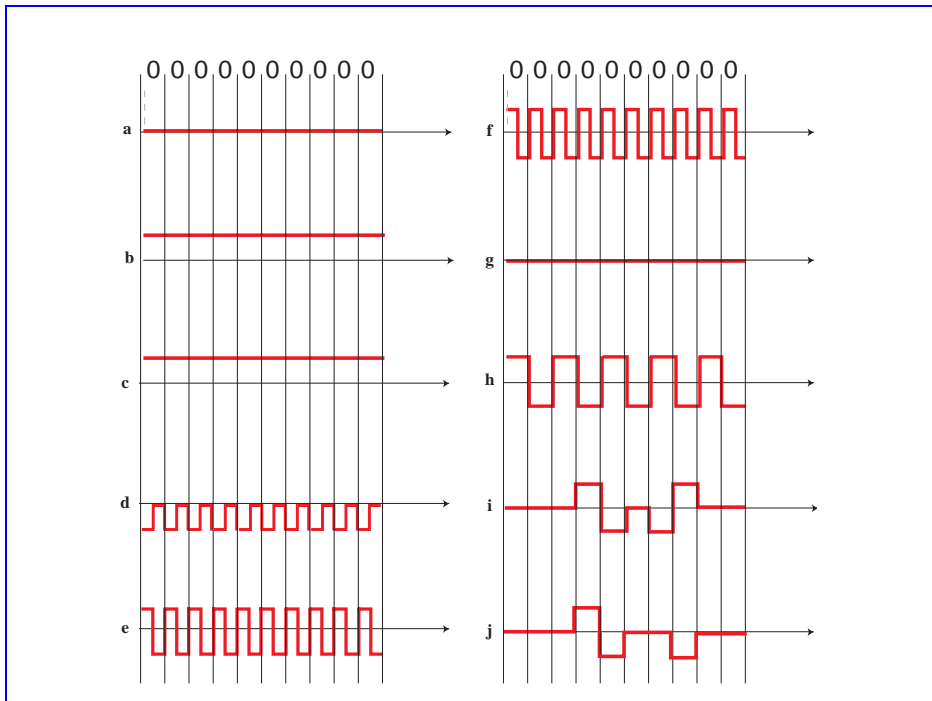
Multiple-Choice Questions

- 17. a
- 19. d
- 21. c
- 23. d
- 25. c
- 27. a
- 29. b
- 31. b
- 33. a
- 35. c
- 37. a
- 39. d

Exercises

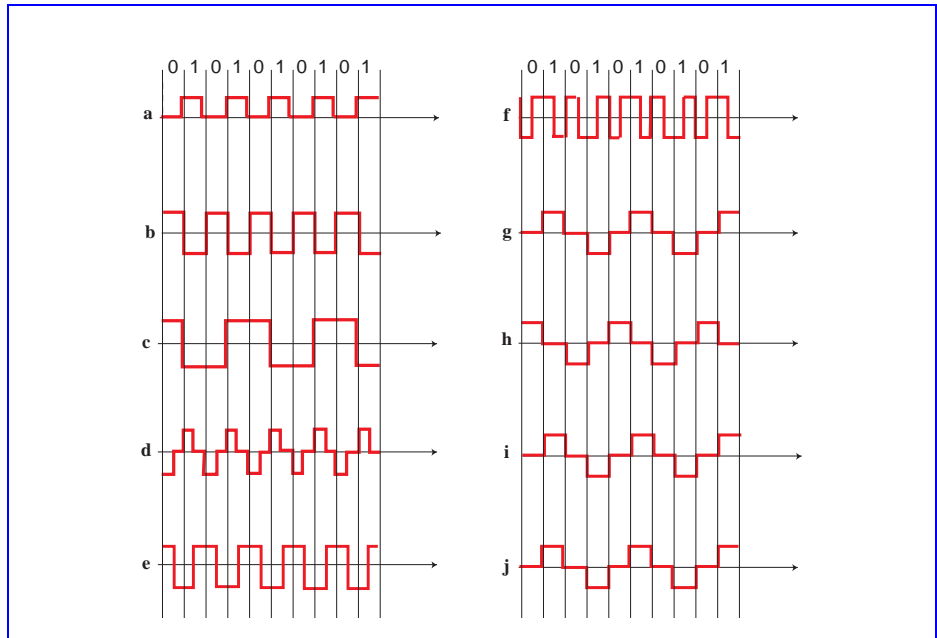
- 41. See Figure 4.1

Figure 4.1 Exercise 41



- 43. See Figure 4.2
- 45. 00100100

Figure 4.2 Exercise 43



47. 00101101 (assuming the first bit is 0)
 49. 00011100
 51. 10001001
 53. 8,000 samples per second
 55. $1/8000 = 0.125$ ms
 57. Two bits per sample: bit rate = $8,000 \times 2 = 16,000$.

