Multiple choice Questions

1- Unipolar, bipolar, and polar encoding are types of __________ encoding.
   a. Line
   b. Block
   c. NRZ
   d. Manchester

2- If a symbol is composed of 3 bits, there are ________ data levels.
   a. 2
   b. 4
   c. 8
   d. 16

3- Pulse rate is always _________ the bit rate.
   a. Greater than
   b. Less than
   c. Greater than or equal to
   d. Less than or equal to

4- __________ encoding has a transition at the middle of each bit.
   a. RZ
   b. Manchester
   c. Differential Manchester
   d. All the above

5- __________ encoding has a transition at the beginning of each 0 bit.
   a. RZ
   b. Manchester
   c. Differential Manchester
   d. All the above
6. PCM is an example of ______ conversion.
   a. Digital-to-digital
   b. Digital-to-analog
   c. Analog-to-analog
   d. Analog-to-digital

7. If the frequency spectrum of a signal has a bandwidth of 500 Hz with the highest frequency at 600 Hz, what should be the sampling rate, according to the Nyquist theorem?
   a. 200 samples/s
   b. 500 samples/s
   c. 1000 samples/s
   d. 1200 samples/s

8. The Nyquist theorem specifies the minimum sampling rate to be_______
   a. Equal to the lowest frequency of a signal
   b. Equal to the highest frequency of a signal
   c. Twice the bandwidth of a signal
   d. Twice the highest frequency of a signal

9. One factor in the accuracy of a reconstructed PCM signal is the ______
   a. Signal bandwidth
   b. Carrier frequency
   c. Number of bits used for quantization
   d. Baud rate

10. Which encoding type always has nonzero average amplitude?
    a. Unipolar
    b. Polar
    c. Bipolar
    d. All the above

11. Which of the following encoding methods does not provide for synchronization?
    a. NRZ-L
    b. RZ
    c. NRZ-I
    d. Manchester
12. Which encoding method uses alternating positive and negative values for Is?
   a. NRZ-I
   b. Manchester
   c. AMI
   d. All the above

13. If the maximum value of a PCM signal is 31 and the minimum value is -31, how many bits were used for coding?
   a. 4
   b. 5
   c. 6
   d. 7

14. RZ encoding involves signal levels.
   a. Two
   b. Three
   c. Four
   d. Five

15. Which quantization level results in a more faithful reproduction of the signal?
   a. 2
   b. 5
   c. 16
   d. 32

16. Which encoding technique attempts to solve the loss of synchronization due to long strings of 0s?
   a. BnZS
   b. NRZ
   c. AMI
   d. (a) and (b)

17. Block coding can help in __________ at the receiver.
   a. Synchronization
   b. Error detection
   c. Attenuation
   d. (a) and (b)
18. In _______ transmission, bits are transmitted simultaneously, each across its own wire.
   a. Asynchronous serial
   b. Synchronous serial
   c. Parallel
   d. (a) and (b)

19. In _______ transmission, bits are transmitted over a single wire, one at a time.
   a. Asynchronous serial
   b. Synchronous serial
   c. Parallel
   d. (a) and (b)

20. In _______ transmission, a start bit and a stop bit frame a character byte.
   a. Asynchronous serial
   b. Synchronous serial
   c. Parallel
   d. (a) and (b)

21. In asynchronous transmission, the gap time between bytes is _______.
   a. Fixed
   b. Variable
   c. A function of the data rate
   d. Zero

22. Synchronous transmission does not have _______.
   a. A start bit
   b. A stop bit
   c. Gaps between bytes
   d. All the above.
Exercises

23. If the bit rate of a signal is 1000 bps, how many bits can be sent in 5 s? How many bits in 1/5 s? How many bits in 100 ms?

24. Assume a data stream is made of ten 0s. Encode this stream, using the following encoding schemes.
   a. Unipolar
   b. NRZ-L
   c. NRZ-I
   d. RZ
   e. Manchester
   f. Differential Manchester
   g. AMI

25. Repeat Exercise 24 for a data stream of ten 1s.

26. Repeat Exercise 24 for a data stream of 5 alternating 0s and 1s.

27. Repeat Exercise 24 for a data stream of three 0s followed by two 1s followed by two 0s and another three 1s.

28. Figure 1 is the unipolar encoding of a data stream. What is the data stream?

29. Figure 2 is the NRZ-L encoding of a data stream. What is the data stream?

30. Repeat Exercise 29 if the figure is the NRZ-I encoding of a data stream.
31. Figure 3 is the RZ encoding of a data stream. What is the data stream?

32. Figure 4 is the Manchester encoding of a data stream. What is the data stream?

33. Repeat Exercise 32 if the figure is the differential Manchester encoding of a data stream.

34. Figure 5 is the AMI encoding of a data stream. What is the data stream?

35. How many amplitude levels are there for each of the following methods?
   a. Unipolar
   b. NRZ-L
   c. NRZ-I
   d. RZ
   e. Manchester
   f. Differential Manchester
36. What is the sampling rate for PCM if the frequency ranges from 1000 to 4000 Hz?

37. using the Nyquist theorem, calculate the sampling rate for the following analog signals.
   a. A Low –pass analog signal with bandwidth of 2000 Hz
   b. An analog signal with frequencies from 2000 to 6000 Hz
   c. A signal with a horizontal line in the time-domain representation
   d. A signal with a vertical line in the time-domain representation

38. If a signal is sampled 8000 times per second, what is the interval between each sample?

39. If the interval between two samples in a digitized signal is 125 µs, what is the sampling rate?

40. A signal is sampled. Each sample represents one of four levels. How many bits are needed to represent each sample? If the sampling rate is 8000 samples per second, What is the bit rate?

41. We want to transmit 1000 characters with each character encoded as 8 bits
   a. find the number of transmitted bits for synchronous transmission
   b. find the number of transmitted bits for asynchronous transmission
   c. find the redundancy percent in each case