

Assignment - 2
Deadline: 14 July, 2023
Total Marks: 80
Total Questions: 20

Q1. A non-periodic composite signal contains frequencies from 5 to 40 KHz. The peak amplitude is 10 V for the lowest and the highest signals and is 30 V for the 20-KHz signal. Assuming that the amplitudes change gradually from the minimum to the maximum and then maximum to the minimum, draw the frequency spectrum. [3]

Q2. A signal travels from point X to point Y. At point X, the signal power is 100 W. At point Y, the power is 80 W. What is the attenuation in decibels? [2]

Q3. A line has a signal-to-noise ratio of 2000 and a bandwidth of 12000 KHz. What is the maximum data rate supported by this line? [4]

Q4: What is the total delay (latency) for a frame of size 6 million bits that is being sent on a link with 5 routers each having a queuing time of 5 μ s and a processing time of 2 μ s. The length of the link is 3000 Km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 10 Mbps. Which component of the total delay is dominant? Which one is negligible? [4]

Q5: A periodic signal has a bandwidth of 20 Hz. The highest frequency is 60 Hz. What is the lowest frequency? Draw the spectrum if the signal contains all frequencies of the same amplitude. [3]

Q6: Discuss the difference between Attenuation and Distortion. [2]

Q7: A signal with 200 milliwatts power passes through 10 devices, each with an average noise of 2 microwatts. What is the SNR? What is the SNRdB? [4]

Q8: What is the bit rate for each of the following signals? [6]

- a. A signal in which 1 bit lasts 0.001 s
- b. A signal in which 1 bit lasts 2 ms
- c. A signal in which 10 bits last 20 μ s

Q9: Between a high SNR and a low SNR, which one is more desirable? Explain why. [3]

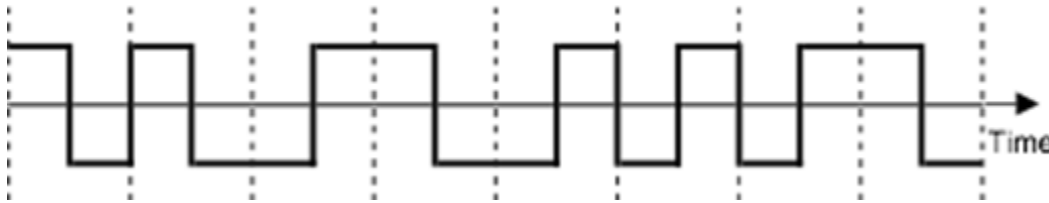
Q10: How many bits are needed if a digital signal has : [3]
I. 67 levels

- ii . 128 levels
- Iii, 198 levels

Q11. Write the differences between baseline wandering and DC component and its effect on digital transmission. [4]

Q12. Define scrambling and give its purpose. [3]

Q13. The figure below represents the Differential Manchester encoding of a data stream. What is the data stream? D. Manchester does not require block coding, explain briefly. [5]



Q14. Convert the following bit stream to signal using one scheme for each requirement: [6]

Data: **1 0 0 0 1 1 0 1 1 0 1 1 0 0 0 0 1**

Requirements

i) **You can ignore:** Self synchronization and DC component problem.

Keep in mind: Low bandwidth is required

ii) **You can ignore:** High bandwidth problem

Keep in mind: Self synchronization is necessary and no DC component problem should exist.

iii) **You should maintain a proper balance of bandwidth utilization and self synchronization.**

Q15. Differential Manchester solves a number of common problems that occur in signal encoding processes, what are they and how are they solved? [4]

Q16. What is the result of scrambling the sequence 11100000000000 using the following scrambling techniques? Assume that the last non-zero signal level has been positive. [4]

a. B8ZS

b. HDB3 (The number of nonzero pulses is odd after the last substitution)

Q17. What is the **advantage** and **disadvantage** of using Block Coding signal encoding technique? Convert the Data given below into signal using 4B/5B block coding technique with MLT-3 line coding scheme. The table below shows the substitution of blocks. [6]

Data: 1 0 0 1 1 0 1 0 1 1 0 0

Binary	4B/5B Code	Binary	4B/5B Code
0000	11110	1001	10011
0001	01001	1010	10110
0010	10100	1011	10111
0011	10101	1100	11010
0100	01010	1101	11011
0101	01011	1110	11100
0110	01110	1111	11101
0111	01111	1001	10011

Q18. Explain how Bipolar-AMI scheme rules are violated in B8ZS Scrambling. [2]

Q19. Sometimes, bipolar encoding schemes are preferred over unipolar encoding schemes although unipolar schemes are less complex. Mention two issues of unipolar encoding that can be avoided using bipolar encoding. [3]

Q20. Why is NRZ-I better than NRZ-L? Explain with proper reasons. [3]