

Assignment -2

Total Marks: 40

1. Distinguish between bandwidth and throughput. [2]
2. If a non-periodic signal has a lowest frequency of 200 kHz and a bandwidth of 60,000 Hz, calculate the highest frequency contained in that signal. Draw the frequency domain diagram of this signal if maximum amplitude is 25 V. [3]
3. Consider a channel with a bandwidth of 4 MHz. The signal strength is 17 dB higher than the noise present in the channel.
 - i) What is the highest data rate achievable by this channel? [2]
 - ii) In practice, better error performance can be achieved if we use a lower data rate. Assume we choose a data rate that is 75% of the highest data rate. How many signal levels are needed to achieve this data rate? [2]
4. Suppose you want to send a Word document containing 15 pages to your colleague through a 10 Mbps optical fiber line. Each page in the document has an average of 30 lines with 100 characters per line. The distance between you and your colleague is 6000 km. The signal in the optical fiber propagates at 2×10^8 m/s. There are three routers in the transmission path, and each router has an average processing time of 4 ms. Determine the total delay of this communication. [3]
5. Give short answers to the following:
 - i) What is Baseline Wandering? [1]
 - ii) What is DC Component? [1]
 - iii) Write advantages of NRZ-I and Defferntial Manchester Encoding. [2]
6. Convert the following binary data stream into digital signals using three different line coding schemes(Manchester Encoding, Differential Manchester Encoding, MLT-3). Write the name of each encoding scheme and illustrate the encoded signals on graph paper.
Data Stream: 1 0 1 1 0 0 1 0 1 1 0 [4+4+4]
7. i) Convert the following binary data stream into a digital signal using an appropriate line coding scheme based on the requirements.
Data Stream: 1 0 1 0 0 0 0 0 0 1 1 0 0 0 1
Requirements:
 - This scheme does not have a DC component.
 - The scheme does not provide self-synchronization for long sequences of 0s. [4]
 - ii) Use both scrambling techniques (B8ZS and HDB3) to handle the long sequence of 0s. Illustrate the encoded signal on graph paper, showing how each scrambling technique modifies the long sequence of 0s for synchronization. [4+4]