

FIT1005
Networks and Data Communications
Tutorial – Week 5

Objective of this tutorial:

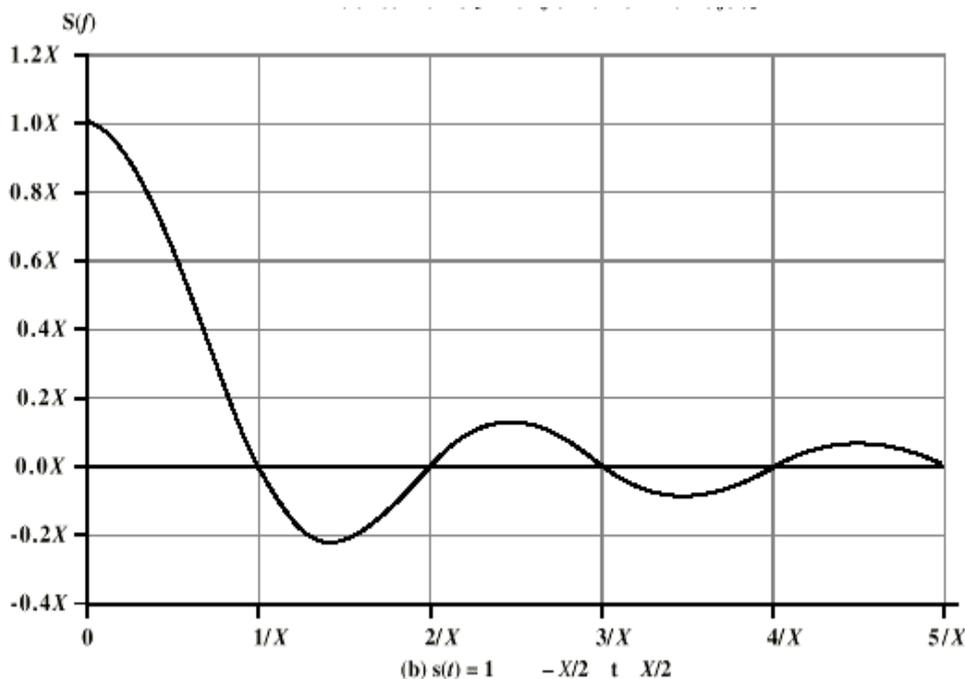
The main purpose of this tutorial is to make students reflect on the main points highlighted in each of the questions and get them to construct useful meanings from what they already know.

How to participate in the tutorial:

Form groups of four students in each and discuss the answers for the following reflective questions with the group members. After spending about 10-12 minutes for each question, discussing with group members, discuss your solutions with the tutor and other groups. The tutor will provide feedback on your solutions.

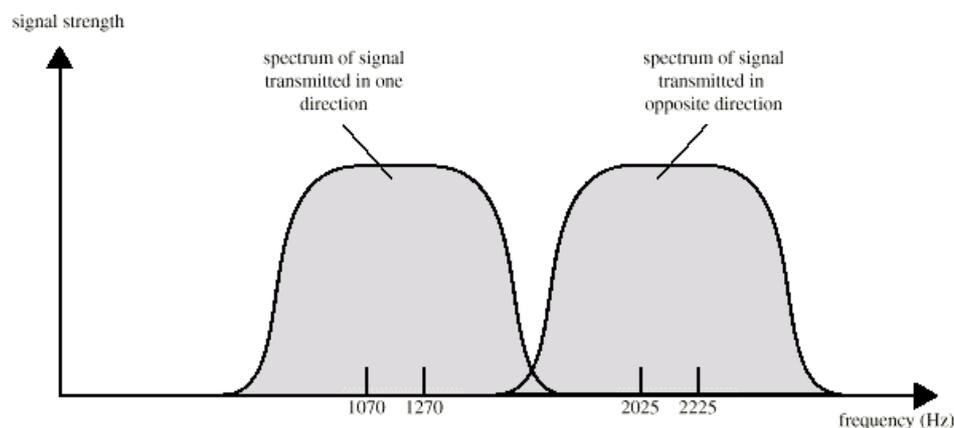
Reflective questions:

1. In general digital waveforms have an infinite bandwidth as shown in the following frequency domain representation. Elaborate on this.

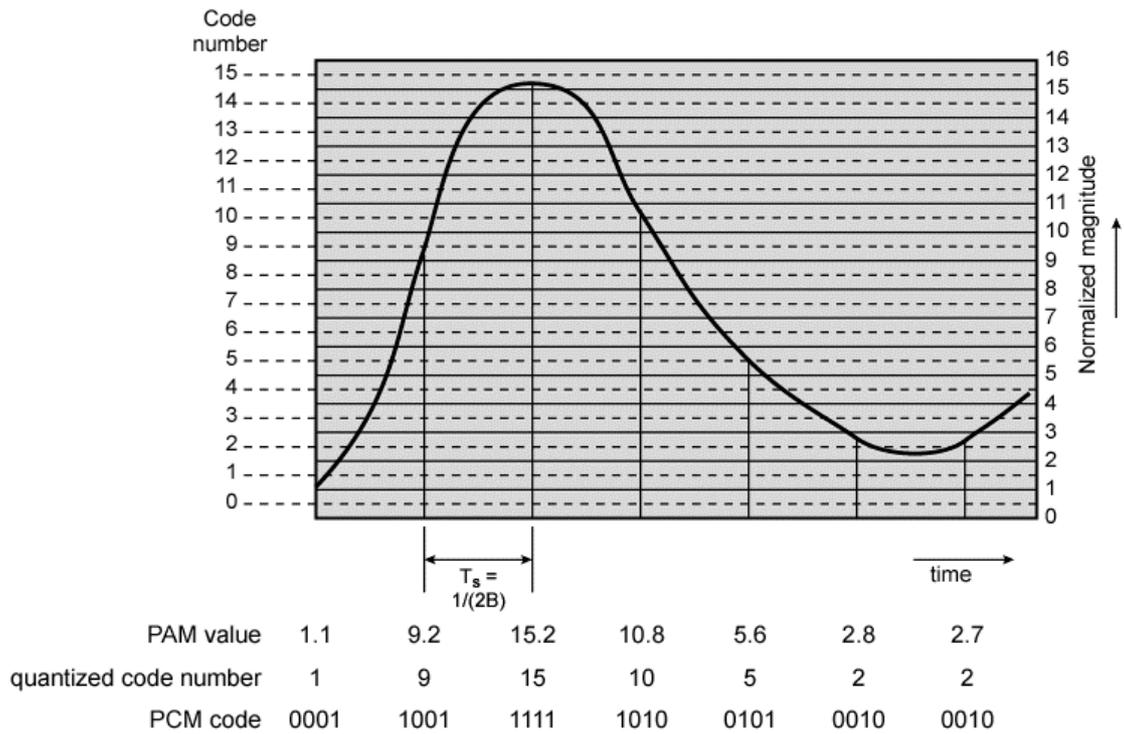


2. The velocity of propagation of a signal through a guided media varies with frequency. What are the implications of this on bandlimited signals?
3. Data bits are mapped to signal elements for transmission using an encoding scheme. What is the significance of the encoding technique for synchronisation of data transmitted?

4. All the biphase encoding techniques require at least one transition per bit time and may have as many as two transitions. Elaborate on the implications.
5.
 - a. Give an example of encoding digital data as analog signals.
 - b. A voice grade line will pass frequencies in the approximate range 300 to 3400 Hz, and signals are transmitted in both directions (full-duplex). Use the following diagram to explain how binary frequency shift keying (BFSK) overcomes interference of signals.



6. In phase shift keying (PSK), the phase of the carrier signal is shifted to represent data. Elaborate on the case where two phases are used to represent the two binary digits (binary phase shift keying).
7. Pulse code modulation (PCM) is a technique used to transform analog data to digital data. The following figure shows how Pulse Amplitude Modulation (PAM) samples are taken at a rate $2B$ (once every $1/2B$ seconds) for a signal with bandwidth B . Each PAM sample is approximated by being quantized into one of 16 different values. Reflect on the fact that it is impossible to recover the original signal exactly. What changes can you make to overcome this problem



8. One of the principal reasons for modulation of analog data to analog signals is to permit frequency division multiplexing. Reflect on this.