KOM Questions – Lecture 2

Data Communications and Networking (Fourth Edition)

Physical Layer and Media

1.1 What does the amplitude of a signal measure? What does the frequency of a signal measure? What does the phase of a signal measure?

1.2 What is a composite signal? How can a composite signal be decomposed into its individual frequencies?

1.3 What are the three types (categories) of transmission impairment?

1.4 A signal travels from point A to point B. At point A, the signal power is $100\ \mathrm{W}$. At point B, the power is $90\ \mathrm{W}$. What is the attenuation in decibels?

1.5 The attenuation of a signal is $-10\ \mathrm{dB}$. What is the final signal power if it was originally $5\ \mathrm{W}$?

1.6 If the bandwidth of the channel is $5\ \mathrm{Kbps}$, how long does it take to send a frame of 100.000 bits out of this device?

1.7 We measure the performance of a telephone line ($4\ \mathrm{KHz}$ of bandwidth). When the signal is $10\ \mathrm{V}$, the noise is $5\ \mathrm{mV}$. What is the maximum data rate supported by this telephone line?

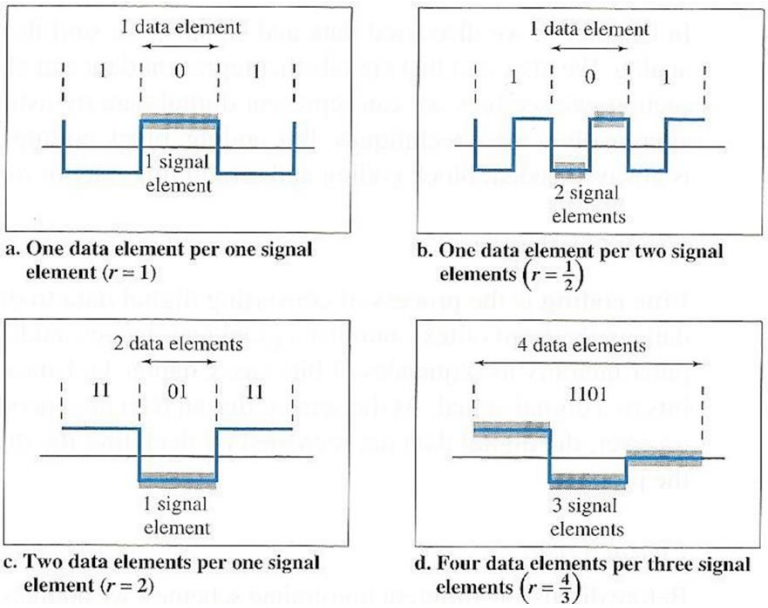
1.8 What is the total delay (latency) for a frame of size 5 million bits that is being sent on a link with 10 routers each having a queuing time of $2\ \mu s$ and a processing time of $1\ \mu s$. The length of the link is$2000\ \mathrm{km}$. The speed of light inside the link is $2 \cdot 10^8\ \mathrm{m/s}$. The link has a bandwidth of $5\ \mathrm{Mbps}$. Which component of the total delay is dominant? Which one is negligible?

Digital Transmission

2.1 What is the difference between a signal element and a data element?

2.2 What is the difference between data rate and signal rate? What is baudrate?

2.3 Calculate the value of the signal rate for each case in the figure below, given that the data rate is $N = 1$ Mbps and $c = \frac{1}{2}$.



a. One data element per one signal element ($r = 1$)

b. One data element per two signal elements $\left(r = \frac{1}{2}\right)$

c. Two data elements per one signal element ($r = 2$)

d. Four data elements per three signal elements $\left(r = \frac{4}{3}\right)$

2.4 Draw the graph of the NRZ-L scheme using each of the following data streams, assuming that the last signal level has been positive.

a) 00000000
b) 11111111
c) 01010101
d) 00110011

2.5 Draw the graph of the Manchester scheme using each of the following data streams, assuming that the last signal level has been positive.

a) 00000000
b) 11111111
c) 01010101
d) 00110011