

Exercises Sheet #3 : Physical Layer

Communication Networks
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Duration : 2 sessions

Exercise #1 :

1. What is the most important function of the physical layer of the OSI model?
 - a) It accepts frames from the physical media.
 - b) It encapsulates upper layer data into frames.
 - c) It defines the media access method performed by the hardware interface.
 - d) It encodes frames into electrical, optical, or radio wave signals.

2. A network administrator is troubleshooting connectivity issues on a server. Using a tester, the administrator notices that the signals generated by the server NIC are distorted and not usable. In which layer of the OSI model is the error categorized?
 - a) presentation layer
 - b) network layer
 - c) physical layer
 - d) data link layer

3. Which function is provided by the OSI physical layer?
 - a) controlling access to media
 - b) transmitting bits across the local media
 - c) performing error detection on received frames
 - d) exchanging frames between nodes over physical network media

4. The delay taken to deliver the data from one host to another on a network is called :
 - a) goodput
 - b) bandwidth
 - c) latency
 - d) throughput

5. What terms represent the maximum and actual speed that can be utilized by a device to transfer data?
 - a) bandwidth; throughput
 - b) throughput; bandwidth
 - c) bandwidth; goodput
 - d) throughput; goodput

6. What is line encoding?
 - a) a method to represent digital information
 - b) a security method used to protect data being transmitted
 - c) a method to represent bits on the media
 - d) a method to change the level of an electrical signal or optical pulse on the media

7. The physical layer is responsible for _____
 - a) line encoding
 - b) channel coding
 - c) modulation
 - d) all of the mentioned

Exercise #2 :

A network with bandwidth of 10 Mbps can pass only an average of 12,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network?

Exercise #3 :

We need to send data at a 1-Mbps rate. What is the minimum required bandwidth, using a combination of 4B/5B and NRZ-I or Manchester coding?

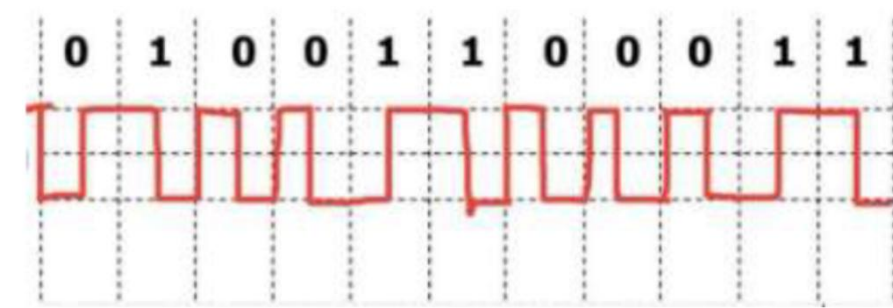
Exercise #4 :

Using the course conventions, draw the graph of the NRZ-L, NRZ-I, RZ, Manchester, Differential Manchester, 4B/5B schemes using each of the following data streams, assuming that the last signal level has been positive.

- a) 00000000
- b) 11111111
- c) 01010101
- d) 00110011
- e) 00011000

Exercise #5 :

What is the encoding technique used in the Figure?



Exercise #6 (Optional):

A system is using NRZ-I to transfer 1-Mbps data. What are the average signal rate and minimum bandwidth?

Note.

$S = c * N * 1/r$, where

- S is the number of signal elements;
- N is the data rate;
- c is the case factor (worst, best, average);
- r mapping ratio is the number of data elements 'd' carried by a signal element 's' $r=d/s$.

$$N = 1 \text{ Mbps} = 1000 \text{ kbps}$$

$$r = 1$$

$c = 1/2$ for the avg. case as worst case is 1 (for sequence 00000...) and best case is 0 (for sequence 11111...)