Universidad de León
Ingeniería Informática
Course on Computer Networks

Weekly Homework no. 1

Submission date: 26th-March-2020 11:00 am
Submit via: foces.informatica.unileon@gmail.com
Format: Only **pdf** format is accepted. Include your name and ID in the document.

--- Ongoing study recommendations ---

This section is not to be included in your homework submission, that means it will not count to your Term 1 grade:

1. Check out Questionnaires 1 through 4. By this time, all the course topics needed for these questionnaires has been taught in the Lectures. Try to resolve the relevant exercises on your own; only after working your solution is acceptable to consult the solutions published in paloatlo.unileon.es/cn.

2. At all times, have the textbook by P&D at hand. Most of the material that we have taught so far belongs in book chapters 1 and 2.

3. Try to attend our weekly lecture at the lecture time that is published in the official calendar (Thursdays 12:30 – 14:30). I'll do my best to keep lectures short, focused and clear; working the Questionnaires and the assigned homework becomes essential for your mastery of CN until we get back to campus.

4. Next week we'll resume the practices; before that happens, I will have to adapt some of the practice scripts for your work at home. For the time being, update your LabBooks so that they properly and fully document the initial practice including the exercise about the TCP/IP Architecture and obtaining the corresponding protocol stacks that we did the past week.

5. Please, have your Linux and C compiler ready for the next practice about sockets and TCP/IP architecture. I will offer you assistance with C programming if you need so. For now, focus your efforts on having your system and compiler ready.

6. If you need assistance, contact me via the email given above. Send me your comments and suggestions for improving the course.

--- Deliverable exercises ---

Exercises about presentation for Chapter 1/Section 4:
· http://paloalto.unileon.es/cn/lect/CN-Ch1-2020-Section4.pdf

*This section **is** to be included in your homework submission. These exercises will be assessed and will count to your Term 1 grade. You must submit your original work and cite sources in case you used some.*

1. Draw the waveforms produced by the NRZ-I encoder in slide no. 19

2. Now, continuing with the preceding question, assume that we replace the tandem 4B/5B + NRZi with a Manchester encoder. Draw the waveforms resulting in this case (Follow the Manchester scheme explained in the relevant slides).

3. Observe slide no. 28 and check that the Channel Capacity calculated is correct.

4. What would you suggest to increase the Shannon's capacity of the considered channel: maybe, increasing the medium Bandwidth? Maybe improving the S/N ratio? Both? Make a brief composition explaining your answers.

5. Briefly explain the Nyquist's criterion, also known as the Sampling Theorem.

6. According to slide no. 27, if your voice has a bandwidth of 6KHz, what is the minimum sampling frequency which will allow us to reconstruct your voice from the samples taken?

Exercises about presentation for Chapter 1/Section 5:
· http://paloalto.unileon.es/cn/lect/CN-Ch1-2018-Section5.pdf

7. Check that the solution to the example on Bidimensional parity (Slide no. 10) is correct. You must assume the role of sender and proceed as it is explained below:

   1st: Compute the horizontal even parity of 1's of each 7-bit block. For example, the parity bit to the first row should be computed like this:

   ```
   0 xor 1 xor 0 xor 1 xor 0 xor 0 xor 1 = 1
   ```

   The calculation appearing on slide no. 10 is correct.

2nd: When all the six 8-bit[1] rows have been computed we can begin the calculation of the vertical parity of each column. For example, the calculation for the first column yields the following result:

```
0 xor 1 xor 1 xor 0 xor 0 xor 1 = 1
```

The vertical parity calculation appearing on slide no. 10 is correct. Now, finish all the calculations, including the last bit, which must hold as much for its column as for its row.

8. Continuing with the preceding exercise, assume that the sender sends the 7 8-bit blocks to the receiver and that the bit standing at the intersection of the second row and the third column gets an error. Simulate the behavior of the receiver and explain what it will do when it discovers the error.

[1] The 8 bits from each row include the parity bit