



ECE 316 - Operating Systems and Networks Laboratory

Assignment 3

General Instructions

For each Assignment, a report (.pdf) and the source-code (e.g., .c, .cpp, .m etc.) of the solution should be submitted through Microsoft Teams “ECE316 - 2022 - Operating Systems and Networks Laboratory” not later than the due date of the Assignment. The report should start with a cover page that clearly contains the assignment number and the Team number and the names of the members. In your report, include only the pseudocode, not the actual code, with any comments and description you may want to add, as well as a typical scenario that you used to test your programs. Please note that the report should be as concise as possible. **Caution:** You are not allowed to upload executables (.exe)!

If input test files are given, you are not allowed to make any changes to the provided input files.

Report File Naming Format: “Team#_Assignment#.pdf”

Description:

The purpose of the first set of exercises is to familiarize yourself with MATLAB and create some waveforms that are used in communication systems.

Exercise 1 (40%): Suppose a system uses 10 volts for binary 1 and 3 volts for binary 0. Additionally, the speed of transmitter-receiver is 1Kbps (meaning the duration of one bit is 1ms). The transmitter wants to transmit the following sequence: 100100100 (Fourier Analysis should be included in your report). Show the signal that the receiver will receive if the line between them acts as a “perfect” filter (low pass filter) with maximum frequency:

1. 300Hz
2. 500Hz
3. 1KHz
4. 5KHz
5. 10KHz
6. 100KHz

Repeat the exercise with sequences 1101111011 and 0101001101.

Exercise 2 (35%): In a communication system with speed of 2Kbps, show the waveform created by the following transformers. Use as input the following binary sequences: a) 10100111 and b) 01101110 and that the frequency of the input signal is 2KHz.

1. ASK
2. FSK
3. PSK
4. QPSK

Exercise 3 (20%): Implement a Pulse Amplitude Modulation (PAM) system. Using a sinusoid signal with a frequency of 6Hz and amplitude of 5, show the samples of signal which the system takes in time intervals of your choosing. You must show the differences between the samples when you use different rates of sampling.



Exercise 4 (5%): You are given the following sinusoid signal:

```
f = 80; % Hz
tmin = -0.05;
tmax = 0.05;
t = linspace(tmin, tmax, 400);
x_c = cos(2*pi*f * t);
plot(t,x_c)
xlabel('t (seconds)')
```

Show the signal that is produced from applying sampling using the following frequencies:

1. 800Hz
2. 125Hz
3. 50Hz
4. 10Hz

You can use the following sinusoid signal for sampling:

```
nmin = ceil(tmin / T);
nmax = floor(tmax / T);
n = nmin:nmax;
x1 = cos(2*pi*f * n*T);
```

where T is the sampling period. Show the sampling signal and comment your findings. What is the smallest “acceptable” sampling frequency that does not lose any information from the original signal?