

Principles of Communication Systems Lab (303 P)

Lab-1 (Due Date: 17-8-2021, Time: 1 pm)

Instructions:

1. **NO PLAGIARISM.** Your solution must be written in your words.
 2. Please strictly follow the LaTeX template for making lab reports. The template has been uploaded on LMS.
 3. Please mention legends, axis labels, titles etc in your plot/subplot for better understanding and clarity.
 4. For best quality, please add .eps format of simulation plot in the report. You can directly export .eps plot from MATLAB.
 5. The report to be submitted must include MATLAB code and all observations pertaining to each plot below the same.
 6. Kindly number your answers correctly.
 7. Please feel free to ask any questions in class or via LMS..
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Questions:

1. Consider a sinusoidal signal $x(t) = \sin(2\pi 50t)$ for 5 complete cycles and perform the following:
 - (a) Plot analog continuous signal
 - (b) Plot analog discrete-time signal
 - (c) Quantize positive samples to 1 and negative samples to -1 and plot the corresponding
 - i) digital discrete-time signal; and ii) digital continuous signal
 - (d) Plot the amplitude spectrum for the sinusoidal signal generated in part (a).
 - (e) Plot the phase spectrum for the sinusoidal signal generated in part (a).

Note: Take a large no. of samples to get a smooth curve. Plot all the sub-parts in the same plot using subplot.
2. Consider the signals $x_1[n] = [-1, 1, 2, 2, -2]$ and $x_2[n] = [2, 1, -1, -2, -1, 1]$ and perform the following operations
 - (a) Plot $x_1[n]$ and $x_2[n]$
 - (b) Plot autocorrelation of both $x_1[n]$ and $x_2[n]$

- (c) Plot cross-correlation between $x_1[n]$ and $x_2[n]$
 - (d) Plot convolution between $x_1[n]$ and $x_2[n]$
 - (e) Plot cross-correlation between $x_1[n]$ and $x_3[-n]$
3. Create a rectangular pulse with amplitude $A = 1$ and duration $\tau = 1$ second and do the following
- (a) Plot the pulse
 - (b) Plot the frequency spectrum of the pulse
 - (c) Plot the phase spectrum of the pulse

Note: Take a large no. of samples to get a smooth curve. Plot all the sub-parts in the same plot using subplot.