

Digital Signal Processing

Lab2

Familiarization with basic CT/DT functions

Functions Used:

Understand the following functions using Matlab online-help feature.

who, whos, input(), disp(), subplot(), figure(), clear all, close all, home, hold on, grid on, grid off, grid, demo, ver, lookfor, length(), pause, plot(), stem(), real(), imag(), zeros(), ones(), exp() function, for statement, if-else statement etc.

Background:

Being the very first lab, the main objective is to familiarize you with the various Matlab functions and use the same to plot the basic signals and display the results.

Problems:

1. Plot the basic signal using Matlab
 - a) Impulse response
 - b) Unit step
 - c) Ramp
 - d) Rectangular
2. Plot the following continuous-time signals.
 - a) $x(t) = Ce^{at}$ where **C** and **a** are real numbers and choose **C** and **a** both positive and negative.
 - b) Plot the same signal taking **a** as pure imaginary number.
 - c) Consider complex exponential signal as specified in **b)** where **C** is expressed in polar form i.e., ($C = |C|e^{j\theta}$) & **a** in rectangular form i.e., ($a = r + j\omega_o$). Then your function $x(t)$, on simplification, becomes

$$x(t) = |C|e^{rt} [\cos(\omega_o t + \theta) + j \sin(\omega_o t + \theta)]$$

Now, plot the signal for different values of **r** and comment on the results.

- i. $r = 0$
- ii. $r < 0$
- iii. $r > 0$

3. Plot the DT exponential function

$$x[n] = a^n, a = |a|e^{j\theta}$$

Choose the suitable value of $|a|$ and θ , then plot the function $x[n]$.

4. Synthesize the signal from the FS Coefficients as $C_0 = 1$, $C_1 = C_{-1} = 1/4$, $C_2 = C_{-2} = 1/2$, $C_3 = C_{-3} = 1/3$.
5. Plot fundamental sinusoidal signal, its higher harmonics up to 5th harmonics and add all of them to see the result. Comment on the result.