1. During lab 4, we have seen numerical implementation of Fourier Series for periodic signals. As first part of this assignment, you need to write a Matlab function that would take an array representing a single period of a signal (`x`), corresponding time array (`t`), and return the Fourier Series coefficients (`Ck`) in exponential form. The function should also be able to take two (2) optional input arguments: number of Fourier coefficients (`Nk`) and plot option (`p`). Use the template '`fourier_series_exp.m`' for this problem.

2. A signal $x = 0.6\left\{u(t+2) - \left(\cos(\pi t) + 1\right)\left[u(t+1) - u(t-1)\right] - u(t-2)\right\}$ with a period $-5 \le t \le 5$ controls the location of the light source in an optical scanner. Plot the signal for the interval $-5 \le t \le 25$, its spectrum ($|C_k|$ vs ω and $\angle C_k$ vs ω), and reconstructed time domain signal using 51 Fourier Series coefficients. Use the function you have written in problem 1 for solving this problem.

3. So far all the signals we have handled in this course are real signals. However, we can also use complex numbers to represent signals (complex signals). Let's consider a single period of a periodic signal $z(t) = t^3 - j2\pi t^2$, $0 < t \le 5$. Calculate 51 Fourier Series coefficients (C_k) for this signal and reconstruct the time domain signal $\hat{z}(t)$ using these Fourier Series coefficients. Plot the spectrum ($|C_k|$ vs ω and $\angle C_k$ vs ω) and the real and imaginary part of $z(t)$ and $\hat{z}(t)$ for an interval of $0 \le t \le 10$. You can modify the Matlab file '`fs_numerical.m`' which was used during the lab for solving this problem. Following are the sample plots for your reference.