Class Study (09.12.2024) – Group 1

Q1) **Signals**: Create a step function (heaviside) and an exponentially decaying signal.
Task:

- Define a unit step function starting at t=0.
- Define an exponentially decaying signal of the form e^(-3t).
- Use a time range of t=0 to t=6, with a step size of 0.1 seconds initially.
- Compute the convolution of these two signals.
- Plot the result and observe how it changes when you decrease the step size to 0.01 seconds.
- And plot all the figures using subplot function. (for t=0.1 and t=0.01)
- Give correct name to the axis, legend.
- Use comments for the explanation of the code.

Q2)

Task:

- Correct the below code. And fill the empty comments with dots (%...)
- Explain the code with your comments.

```
clc;
clar;
close alll;

Fs = 100; % ...
T = 1/FS; % ...
L = 1000; % ...
t = (0;L-1)*T; % ...

%No need for correction starts
f_sine = 5; % ...
sine_wave = sin(2*pi*f_sine*t); %...

rect_pulse = (t >= 0.4 & t <= 0.6); % ...

fft_sine = fft(sine_wave); %...
P2_sine = abs(fft_sine/L);
P1_sine = P2_sine(1:L/2+1);
P1_sine(2:end-1) = 2*P1_sine(2:end-1);
f_sine_fft = Fs*(0:(L/2))/L;

fft_rect = fft(rect_pulse);
P2_rect = abs(fft_rect/L);
P1_rect = P2_rect(1:L/2+1);
P1_rect(2:end-1) = 2*P1_rect(2:end-1);
f_rect_fft = Fs*(0:(L/2))/L;
%No need for correction ends

% ...
figre;
subplt(2,1,1);
plot(t, sine_wave, 'r', 'LineWidth', 1.5);
title('Sine Wave (Time Domain)');
xlabel('Time (s)');
ylabel('Amplitude');

subplot(2,1,);
plot(f_sine_fft, P1_sine, 'b', 'LineWidth', 25);
title('Sine Wave (Frequency Domain)');
xlabel('Frequency (Hz)');
ylabel('|Amplitude|');

% ...
figure;
subplot(2,2,1);
plot(t, rect_pulse, 'k', 'LineWidth', 1.5);
tite('Rectangular Pulse (Time Domain)');
xlabel('?');
ylabel('?');

subplot(2,1,2);
plot(f_rect_fft, P1_rect, 'm', 'LineWidth', 1.5);
title('Rectangular Pulse (Frequency Domain)');
xlabel('?');
ylael('? ');
```