EE200: Signals, Systems and Networks

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Coding Assignment

Instructions

- Problem 1 has already been solved for you.
- Problem 2 to Problem 5 each worth 2.5 marks.
- You have to put the code in solution pdf as well as requested plots in a single pdf file. Upload the file online on mookit.

Problem 1

Plot $x(t) = 2u(t+1) + 2u(t) - 3u(t-3) - 2u(t-5)$ using Matlab.

Solution

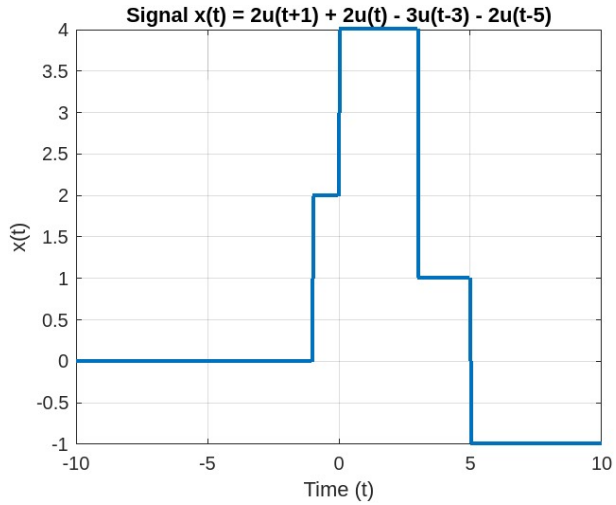
```
% Define the time vector
t = -10:0.01:10;

% Define the unit step function
u = @(t) double(t >= 0);

% Define the signal x(t)
x = 2 * u(t + 1) + 2 * u(t) - 3 * u(t - 3) - 2 * u(t - 5);

% Plot the signal
figure;
plot(t, x, 'LineWidth', 2);
xlabel('Time (t)');
ylabel('x(t)');
title('Signal x(t) = 2u(t+1) + 2u(t) - 3u(t-3) - 2u(t-5)');
grid on;
```

Listing 1: MATLAB code to define and plot signal $x(t)$



Problem 2

Write a MATLAB script to compute and plot the Fourier Transform of a given signal $x(t) = e^{-2t}u(t)$, where $u(t)$ is the unit step function.

Tasks:

1. Compute the Fourier Transform.
2. Plot the magnitude and phase of the Fourier Transform.

Problem 3

Given two discrete-time signals $x[n] = \{1, 2, 3, 4\}$ and $h[n] = \{1, -1, 1, -1\}$, write a MATLAB script to compute their convolution.

Tasks:

1. Compute the convolution.
2. Plot the original sequences and their convolution result.

Problem 4

Given the transfer function:

$$H(s) = \frac{s^2 + 2s + 5}{s^3 + 6s^2 + 11s + 6}$$

Write a MATLAB script to plot the pole-zero map of the system and determine its stability.

Tasks:

1. Plot the pole-zero map.
2. Determine the stability of the system based on the location of the poles.

Problem 5

Consider a periodic square wave $x(t)$ with period $T = 2\pi$ and duty cycle 50

$$x(t) = \begin{cases} 1 & \text{for } 0 \leq t < \pi \\ -1 & \text{for } \pi \leq t < 2\pi \end{cases}$$

Write a MATLAB script to compute and plot the Fourier series coefficients and reconstruct the signal using the first 10 terms.

Tasks:

1. Compute the Fourier series coefficients.
2. Plot the magnitude of the Fourier series coefficients.
3. Reconstruct the signal using the first 10 terms and plot the original and reconstructed signals.