Laboratory Work #02
DIGITAL SIGNAL PROCESSING (DSP)

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1. Write a MATLAB program to compute the first L samples of the inverse of rational Z-transforms where the value of L is provided by the user through the command input. Using this program to compute and plot the first 50 samples of the inverse of following $G(z)$. Use the command stem for plotting the sequence generated by the inverse transform.

$$G(z) = -2 + \frac{10}{4 + z^{-1}} - \frac{8}{2 + z^{-1}}, |z| > 0.5$$

2. Generate and plot a sequence

$$x[n] = \sin(\frac{5\pi}{16} n)$$

with $0 \le n \le 50$. Compute the energy of the sequence.

3. Writing a MATLAB program to compute the circular convolution of two length-N sequences via the DFT-based approach. Using this program to determine the following pair of sequences:

$$g[n] = \{7, 4, -9, 0, 2, -5\}, h[n] = \{1, -1, 2, 0, 10, 5\} \text{ or}$$

$$g[n] = e^{j\pi n/4}, h[n] = 2^n \ 0 \le n \le 15$$

and plot the result sequence.

4. Write a MATLAB program to compute and plot the response of input as

$$x[n] = \cos(0.2 * \pi * n)$$

and a causal finite-dimensional discrete-time system characterized by a difference equation of the following form:

$$y[n] + 0.3 * y[n-1] + 0.5 * y[n-2] - 0.72 * y[n-3] =$$
$$1.8 * x[n] + 0.34 * x[n-1] - 1.32 * x[n-2] - 0.86 * x[n-3]$$

Generate and plot the first 31 samples of the sinusoidal response of the system.