

Digital Signal Processing

Assignment

Answer all the questions:

1. If the $x(n) = \begin{cases} 1 & \text{for } 0 \leq n \leq 3 \\ 0 & \text{elsewhere} \end{cases}$, then sketch the signal $y_1(n) = x(n-2)$.

2. Check the following system is linear or not: $y(n) = nx^2(n)$. Also check the time invariance of the above system.

3. If $Y(z) = \frac{0.5(1 - 0.5z^{-1})}{(1 - 0.25z^{-1})(1 - 0.75z^{-1})(1 - z^{-1})}$, find the steady-state value of $y(n)$ if it exists.

4. Compute the DFT of a sequence $(-1)^n$ for $N=4$.

5. Using residue method, find the inverse z-transform of

$$X(z) = \frac{z+1}{(z+0.2)(z-1)}, |z| > 1.$$

6. Find the output $y(n)$ of a filter whose impulse response is $h(n) = \{1, 1, 1\}$ and the input signal $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using Overlap-add method.

7. Briefly discuss about Sampling theorem and aliasing effect.