

Problem-solving session

The Discrete-Variable Fourier Transform

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Exercise#1

(based on exercise 4.21 from Vol. ST-II by Emilio Gago)

In this exercise, the analysis of a system comprising two cascaded systems, whose impulse response is $u(n)$, is considered again. Remark: the inverse system was characterized by $h^{-1}(n) = \delta(n) - 2\delta(n-1) + \delta(n-2)$

- Determine the frequency response (i.e., the transfer function) of the system.
- Determine the frequency response (i.e, the transfer function) of the inverse system.
- Check that $H^{-1}(\Omega)$ is the inverse system of $H(\Omega)$ by operating in the frequency-domain.
- Let $x(n) = \cos(\Omega_0 n)$, with $\Omega_0/2\pi$ an irrational number, be the input of the system, calculate the output to the system with $h(n) = (n+1)u(n)$.
- Compute the output of the inverse system when the input is the output from the previous section.