2024-2025

Serie N° 7

Exercice N°1 :

Determine and represent the frequency responses of the following systems:

1- $y(n) = \frac{1}{2}[x(n) + x(n-1)]$; **2-** $y(n) = \frac{1}{2}[x(n) - x(n-1)]$; **3-** $y(n) = x(n-4)$

4- $y(n) = \frac{1}{2}[x(n+1) - x(n-1)]$; **5-** $y(n) = \frac{1}{2}[x(n+1) + x(n-1)]$

Exercice N°2 :

Consider the following Z transfer function:

$$H(Z) = \frac{3 - \frac{5}{6}Z^{-1}}{\left(1 - \frac{1}{4}Z^{-1}\right)\left(1 - \frac{1}{3}Z^{-1}\right)}$$

1- Find the poles and zeros of H(Z) and represent them in the complex plane
2- Decompose H into simple elements and determine h(k). the causal inverse of H(Z)
3- Study the stability of the system.

Exercice N°3 :

Let the IRF filter be described by its difference equation:

$$y(n) = x(n) + x(n-4)$$

a- Calculate and represent the module and phase of its spectrum
b- Determine your answer for $x(n) = \cos\left(\frac{pi}{2}n\right) + \cos\left(\frac{pi}{3}n\right) \quad -\infty < n < +\infty$

Exercice N°4 :

Consider the following IRF filter:

$$y(n) = x(n) + x(n-10)$$

a- Calculate and represent the module and phase of its spectrum
b- Determine your answer for : $x(n) = \cos\left(\frac{pi}{10}n\right) + 3\sin\left(\frac{pi}{3}n + \frac{pi}{10}\right)$