PTC2324: Processamento Digital de Sinais I

Respostas: Lista de exercícios 5 complementar

1. (a) $K_1 = \dfrac{7}{8}$

   (b) $K_2 = \dfrac{3}{4}$

   (c) $K_3 = \dfrac{1}{101}$

   (d) $K_4 = \dfrac{5}{4}$

4. (a) $a = -\dfrac{9}{8}$

   (b) $y(n) = \dfrac{1}{4}$

5. (c) $x(0) = 1$

6. $v(-38) = -\left[\dfrac{b}{(b-a)(b-c)(b-d)} + \dfrac{c}{(c-a)(c-b)(c-d)} + \dfrac{d}{(d-a)(d-b)(d-c)} \right]$

7. (a) $H_1(z) = \dfrac{z^6 - \alpha^6}{z^6}$

   (b) $\text{RC}_{H1}: \ |z| > 0$

   (c) $H_2(z) = \dfrac{z^6}{z^6 - \alpha^6}$

   (d) • $\text{RC}_{H2}: \ |z| < \alpha \Rightarrow$ sistema não causal e instável

   • $\text{RC}_{H2}: \ |z| > \alpha \Rightarrow$ sistema causal e estável

   (e) • 0 Hz, 2000 Hz, 4000 Hz $\rightarrow$ frequências que não sofrem rebatimento.

   • 6000 Hz, 10000 Hz, ... $\rightarrow$ frequências que sofrem rebatimento.

   (f) Sim, por exemplo com $H(z) = \dfrac{z^6 - 1}{z^6 - r^6}$, com $0 < r < 1$ e $r \approx 1$.

8. (a) $\mathcal{X}(z) = z^{-2}$

   (b) $\mathcal{W}(z) = z^{-3}$

   (c) $\mathcal{W}(z) = z^{-5} + z^{-1}$

9. • $y_{\text{nat}}(n) = \dfrac{1}{9}\delta(n) + \dfrac{1}{18}\left[\left(\dfrac{1}{3}\right)^n + \left(-\dfrac{1}{3}\right)^n \right] u(n-1)$

   • $y_{\text{for}}(n) = \dfrac{3}{4}\left[\dfrac{9}{2} - 3\left(\dfrac{1}{3}\right)^n - \dfrac{3}{2}\left(-\dfrac{1}{3}\right)^n \right] u(n-1)$

   • $y_{\text{com}} = \dfrac{1}{9}\delta(n) + \dfrac{1}{4}\left[\dfrac{27}{2} - \dfrac{79}{9}\left(\dfrac{1}{3}\right)^n - \dfrac{77}{18}\left(-\dfrac{1}{3}\right)^n \right] u(n-1)$

10. (a) $y_{\text{nat}}(n) = \dfrac{1}{8}\delta(n) + \left[\dfrac{1}{4}\left(\dfrac{1}{2}\right)^n - \dfrac{1}{8}\left(\dfrac{1}{4}\right)^n \right] u(n-1)$

   (b) $y_{\text{for}}(n) = \delta(n) + \left[\dfrac{8}{3} - 2\left(\dfrac{1}{2}\right)^n + \dfrac{1}{3}\left(\dfrac{1}{4}\right)^n \right] u(n-1)$

   (c) $y_{\text{com}} = \dfrac{9}{8}\delta(n) + \left[\dfrac{8}{3} - \dfrac{7}{4}\left(\dfrac{1}{2}\right)^n + \dfrac{5}{24}\left(\dfrac{1}{4}\right)^n \right] u(n-1)$