Damir Bučar

Priprema

0036438657

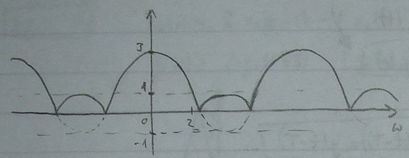
varijanta C, lab 2

3.1.1-a $x_1(n) = \{\dots 0, 0, 1, \underline{1}, 1, 0, 0 \dots\}$, $N = 3$ uzorka različita od nule

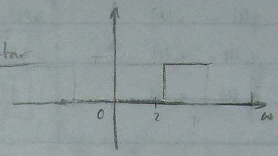
$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x(n)\, e^{-j\omega n} = \sum_{n=-1}^{1} x(n)\, e^{-j\omega n} = 1 \cdot e^{-j\omega(-1)} + 1 \cdot e^{-j\omega 0} + 1 \cdot e^{-j\omega 1} =$$

$$= e^{j\omega} + 1 + e^{-j\omega} = \underline{1 + 2\cos\omega}$$

amp. spektar $|1 + 2\cos\omega|$



fazni spektar



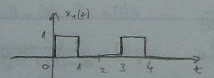
3.2.1-a

Shannonov teorem otipkavanja • vremenski kontinuirani signal $x(t)$, s frekvencijama ne većim od F_{MAX}, može biti egzaktno rekonstruiran iz svojih uzoraka $x(n) \triangleq x(nT)$, ako je OTIPKAVANJE provedeno s frekvencijom $\boxed{F_s = \frac{1}{T}}$ koja je veća od $\boxed{2F_{MAX}}$.

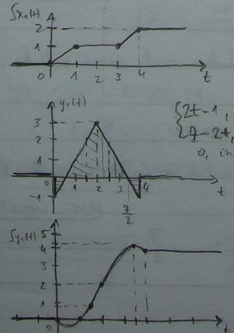
= minimalna frekvencija otipkavanja za koju je moguća rekonstrukcija signala x iz uzoraka x_s – NYQUISTOVA FREKVENCIJA $(F_s = 2F_{MAX})$

• $x(t)$, $F_{MAX} = 8\,kHz \rightarrow F_s \geq 2F_{MAX} \rightarrow \boxed{F_s \geq 16\,kHz}$ $\boxed{T = \frac{1}{F_s} = 6{,}25 \cdot 10^{-5}\,s}$

3.3.1-a a)



b)



$$\begin{cases} 2t-1, & [0,2) \\ 7-2t, & (2,4) \\ 0, & \text{inače} \end{cases}$$

$t=2 \rightarrow int = \left(3 \cdot \frac{3}{2} - 1 \cdot \frac{1}{2}\right)\frac{1}{2} = \underline{2}$

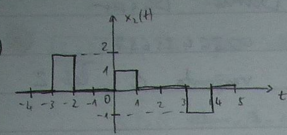
$t=1 \rightarrow int = \underline{0}$

$t=\frac{3}{2} \rightarrow int = \left(2 \cdot 1 - 1 \cdot \frac{1}{2}\right)\frac{1}{2} = \underline{\frac{3}{4}}$

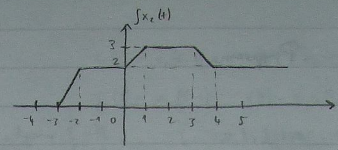
$t=\frac{7}{2} \rightarrow int = 2 + \left(3 \cdot \frac{3}{2}\right) \cdot \frac{1}{2} = \underline{\frac{17}{4}}$

$t=4 \rightarrow int = \frac{17}{4} - \left(1 \cdot \frac{1}{2}\right) \cdot \frac{1}{2} = \underline{4}$

c)



$\Rightarrow$



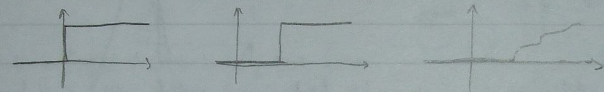
3.3.3 a) • LINEARNI SUSTAV – sustav je linearan ako vrijedi:

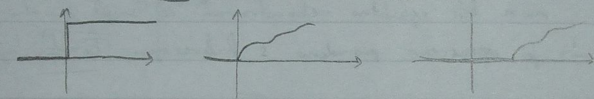
$y(t) = u(t)$ $\qquad \boxed{u(t) = \alpha u_1(t) + \beta u_2(t)}$

$y_1(t) = u_1(t)$ $\qquad y(t) = \alpha u_1(t) + \beta u_2(t)$

$y_2(t) = u_2(t)$ $\qquad \boxed{y(t) = \alpha y_1(t) + \beta y_2(t)}$

• VREMENSKI NEPROMJENJIV SUSTAV $\qquad \boxed{S(u(t-T)) = y(t-T)}$





• MEMORIJSKI SUSTAV – ako za računanje trenutnog odziva treba poznavati prošle ili buduće vrijednost signala

b) 1. $y(t) = \frac{1}{u(t)}$ $\qquad y_1(t) = \frac{1}{u_1(t)}$ $\qquad y_2(t) = \frac{1}{u_2(t)}$ $\qquad u(t) = \alpha u_1(t) + \beta u_2(t)$

$$y(t) = \frac{1}{\alpha u_1(t) + \beta u_2(t)} \neq \alpha y_1(t) + \beta y_2(t)$$

NIJE LINEARAN

$$\left.\begin{aligned} S(u(t-T)) &= \frac{1}{u(t-T)} \\ y(t-T) &= \frac{1}{u(t-T)} \end{aligned}\right\} \text{VREM. NEPROMJENJIV}$$

BEZMEMORIJSKI – potrebno znati samo pobudu u t

2. $y(t) = t^2 u(t) + 2$

$y_1(t) = t^2 u_1(t) + 2$ $\qquad u(t) = \alpha u_1(t) + \beta u_2(t)$

$y_2(t) = t^2 u_2(t) + 2$ $\qquad y(t) = t^2[\alpha u_1(t) + \beta u_2(t)] + 2 = t^2 \alpha u_1(t) + t^2 \beta u_2(t) + 2 \neq \alpha y_1(t) + \beta y_2(t)$

NIJE LINEARAN

$$\neq \left.\begin{aligned} S(u(t-T)) &= t^2 u(t-T) + 2 \\ y(t-T) &= (t-T)^2 u(t-T) + 2 \end{aligned}\right\} \text{VREM. PROMJENJIV}$$

BEZMEMORIJSKI

$\boxed{3.3.3}$ b) 3. $y(t) = u(t-1)$

$y_1(t) = u_1(t-1)$ $\quad u(t) = \alpha u_1(t) + \beta u_2(t)$

$y_2(t) = u_2(t-1)$ $\quad y(t) = \alpha u_1(t-1) + \beta u_2(t-1) = \alpha y_1(t) + \beta y_2(t$

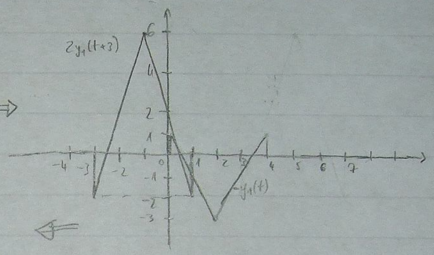
$$\left.\begin{array}{l} S(u(t-T)) = u(t-1-T) \\ y(t-T) = u(t-1-T) \end{array}\right\}$$ VREM. NEPROMJENJIV

LINEARAN

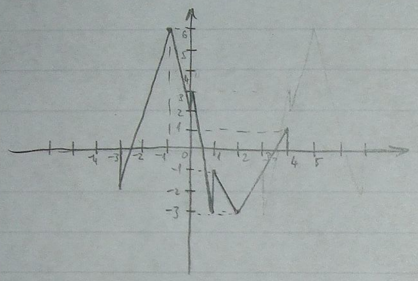
MEMORIJSKI – za izračun potrebno poznavati vrijednost iz proš

$\boxed{3.3.4-a}$ $\quad x_2(t) = 2\,x_1(t+3) - 1\,x_1(t)$

$y_2(t) = 2\cdot y_1(t+3) - 1\cdot y_1(t)$ $\quad \Rightarrow$



$\Leftarrow$



$\boxed{3.3.5-b}$ $\quad y(n+1) = 1.07\cdot\left(y(n) + 1000\right)$ $\quad y(0) = 0$

$y(n+1) = 1{,}07\,y(n) + 1070$

hom $\quad y(n+1) - 1{,}07\,y(n) = 0$ $\quad y_H(n) = C\,q^n$

$C q^n (q - 1{,}07) = 0$ $\quad \boxed{q = 1{,}07}$ $\quad \boxed{y_H(n) = C\cdot 1{,}07^n}$

part $\quad u(n) = 1070 \quad \rightarrow \quad y_P(n) = K$ $\quad \boxed{y_P(n) = -15285{,}71}$

$K - 1{,}07K - 1070 = 0$

$K = \dfrac{1070}{-0{,}07} = \underline{-15285{,}71}$ P

$y(n) = C\cdot 1{,}07^n - 15285{,}71$

$y(0) = C\cdot 1{,}07^0 - 15285{,}71 = 0$ $\quad \boxed{C = 15285{,}71}$

$\boxed{y(n) = 15285{,}71\cdot 1{,}07^n - 15285{,}71}$ P

$\boxed{y(15) = 26888{,}05}$ P $\quad \Rightarrow \quad \approx$ $\boxed{\text{26 godina}}$