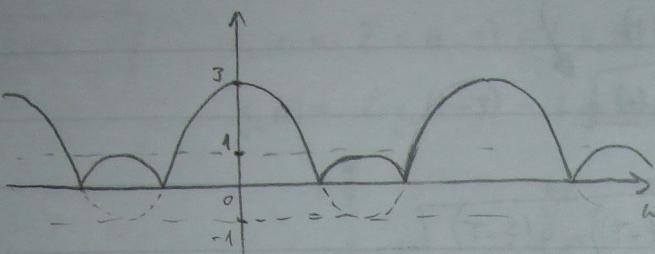


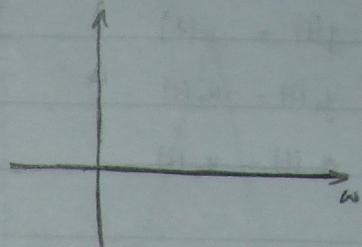
3.1.1-a $x_1(n) = \{ \dots, 0, 0, 1, 1, 1, 0, 0, \dots \}$, $N=3$ uzorak varščata od mreže

$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x(n) e^{-j\omega n} = \sum_{n=1}^1 x(n) e^{-j\omega n} = 1 \cdot e^{-j\omega \cdot 1} + 1 \cdot e^{-j\omega \cdot 0} + 1 \cdot e^{-j\omega \cdot 1} = e^{j\omega} + 1 + e^{-j\omega} = 1 + 2 \cos \omega$$

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



fazni spekter



3.2.1-a

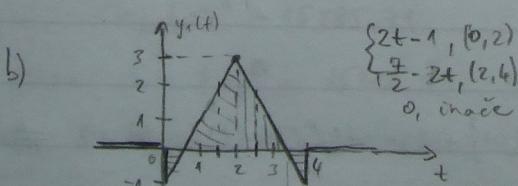
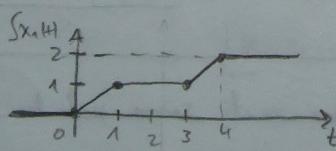
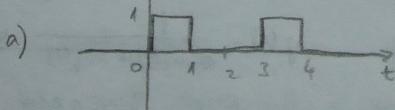
Shannonov teorem otkrivanja • možemo koristiti periodični signal $x(t)$, s frekvencijama većim od F_{MAX} , može biti egralno rekonstruirati iz njih uzoraka

$x(n) \triangleq x(nT)$, tako je otkrivanje provodeno s frekvencijom $F_s = \frac{1}{T}$ koja je veća od $2F_{MAX}$.

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

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

3.3.1-a



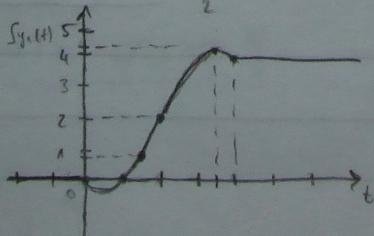
$$t=2 \rightarrow \text{int} = (3 \cdot \frac{3}{2} - 1 \cdot \frac{1}{2}) \frac{1}{2} = 2$$

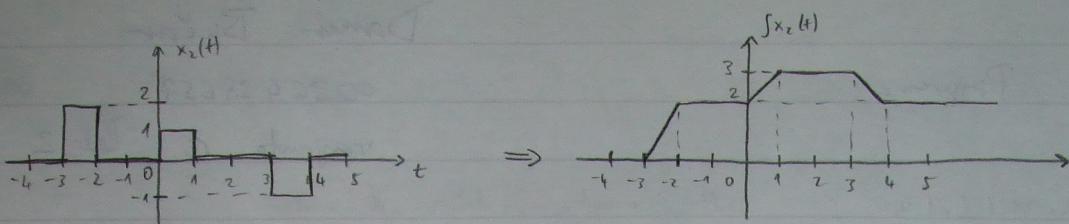
$$t=1 \rightarrow \text{int} = 0$$

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

$$t=\frac{9}{2} \rightarrow \text{int} = 2 + (3 \cdot \frac{3}{2}) \cdot \frac{1}{2} = \frac{17}{4}$$

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





[3.3.3] a) o LINEARNI SUSTAV - sustav je linearan ako vrijedi:

$$y(t) = u(t)$$

$$u(t) = \mathcal{L}u_1(t) + \beta u_2(t)$$

$$y_1(t) = u_1(t)$$

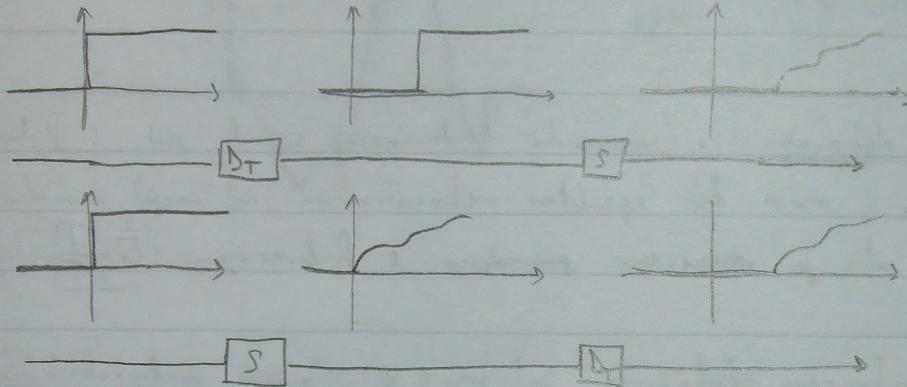
$$y(t) = \mathcal{L}u_1(t) + \beta u_2(t)$$

$$y_2(t) = u_2(t)$$

$$y(t) = \mathcal{L}y_1(t) + \beta y_2(t)$$

• NREMENSKI NEPROMJENJIV SUSTAV

$$\mathcal{S}(u(t-T)) = y(t-T)$$



• MEMORIJALNI SUSTAV - ako za računanje trenutnog izliva treba poznati prešlu ili buduću vrijednost signala

b) 1. $y(t) = \frac{1}{u(t)}$

$$y_1(t) = \frac{1}{u_1(t)}$$

$$y_2(t) = \frac{1}{u_2(t)}$$

$$u(t) = \mathcal{L}u_1(t) + \beta u_2(t)$$

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

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

Nije Linearan

BEZMEMORIJALNI - potrebno znati samo polukru u t

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

$$y_1(t) = t^2 u_1(t) + 2$$

$$u(t) = \mathcal{L}u_1(t) + \beta u_2(t)$$

$$y_2(t) = t^2 u_2(t) + 2$$

$$y(t) = t^2 [\mathcal{L}u_1(t) + \beta u_2(t)] + 2 = t^2 \mathcal{L}u_1(t) + t^2 \beta u_2(t) + 2 \neq \mathcal{L}y_1(t) + \beta y_2(t)$$

Nije Linearan

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

BEZMEMORIJALNI

3.3.3 b) 3. $y(t) = u(t-1)$

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

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

$$\begin{aligned} \mathcal{L}(u(t-T)) &= u(t-1-T) \\ y(t-T) &= u(t-1-T) \end{aligned} \quad \left. \begin{array}{l} \text{VREMENI - NEPROMJENJIV} \\ \text{MEMORISNI} \end{array} \right\}$$

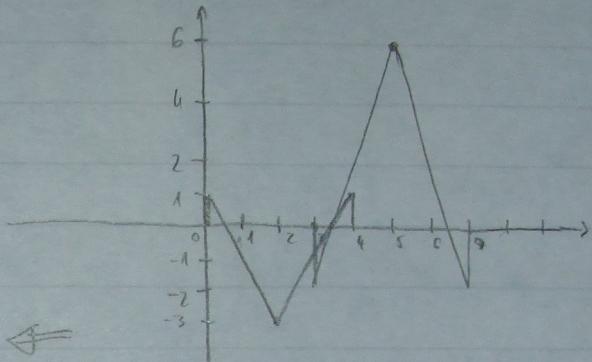
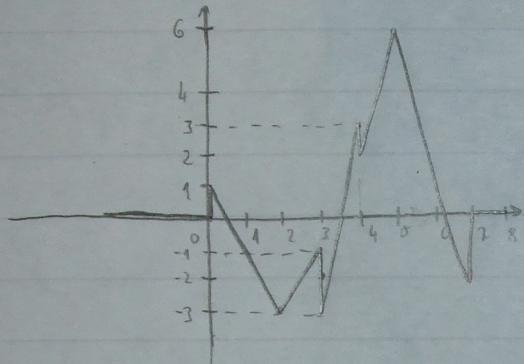
LINEARAN

- za izračun potrebno poznati vrijednost iz prošlosti

3.3.4-a

$$x_2(t) = 2x_1(t-3) - 1x_1(t)$$

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



3.3.5-b

$$y(n+1) = 1.07(y(n) + 1000) \quad y(0) = 0$$

$$y(n+1) = 1.07y(n) + 1070$$

hom

$$y(n+1) - 1.07y(n) = 0$$

$$Cg^n(g - 1.07) = 0 \quad |g = 1.07$$

$$y_h(n) = Cg^n$$

$$| y_h(n) = C \cdot 1.07^n \quad |$$

part

$$u(n) = 1070 \rightarrow y_p(n) = K$$

$$| y_p(n) = -15285,71 \quad |$$

$$K - 1.07K - 1070 = 0$$

$$| K = \frac{1070}{-0,07} = -15285,71 \quad |$$

$$y(n) = C \cdot 1.07^n - 15285,71$$

$$y(0) = C \cdot 1.07^0 - 15285,71 = 0$$

$$| C = 15285,71 \quad |$$

$$| y(n) = 15285,71 \cdot 1.07^n - 15285,71 \quad |$$

$$| y(15) = 26888,05 \quad |$$

\Rightarrow

$\approx [28 \text{ godine}]$