VAJE IZ ELEKTRONIKE (5) 2.11.2005

PRENOSNE FUNKCIJE

1.)

$\frac{z}{y} = \hat{p}$, $\frac{y}{x} = \hat{k}$ vsako operacijo lahko torej faktoriziramo

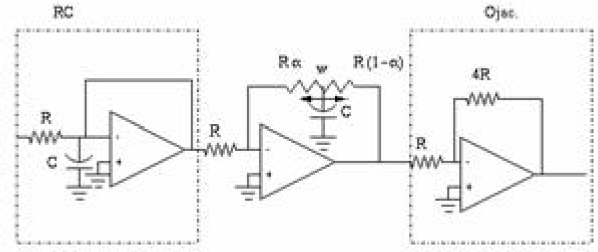
$\frac{z}{x} = \hat{p}\,\hat{k}$

Naredimo vezje, ce poznamo odziv

$$\frac{z}{x} = \frac{tp+4}{1+tp} = -4 \cdot (-0.25tp - 1) \cdot \frac{1}{1+tp}$$

$$\text{odvajalnik}: z = [a(a-1)tp - 1]x \rightarrow a(a-1) = -0.25 \rightarrow a = 0.5$$

$$\text{Ampl.}: \frac{R_2}{R_1} = 4$$



Vezje lahko realiziramo na vec nacinov:

- RC, CR, ojacevalec, sumator
- Vezje iz prejšnje vaje(R_1=R), RC, ojacevalec

2.) RC clen, še enkrat ...

Kaj zares pomenijo prenosne funkcije? Kako je s prenosnimi funcijami sistemov brez operacijskega ojacevalca.

RC clen (enako vezje kot integrator z paralelnim uporom v povratni zanki, le da ni ojacanja!)

$$\frac{z}{x} = \frac{1}{1+tp}$$

CR clen

$$\frac{z}{x} = \frac{tp}{1+tp}$$

Prenosna funkcija RC clena rezultira v differencialni encbi

a.) Delta funkcija na vhodu . Izkaže se, da lahko za vse ostale x(t) zapišemo z(t) analitcno Na žalost to ne velja za vsa vezja...

$$\frac{z}{x} = \frac{1}{1 + t p}$$

$$t \frac{dz}{dt} + z = x \quad \rightarrow \quad t \int_{-\frac{\Delta}{2}}^{\frac{\Delta}{2}} \frac{dz}{dt} + \int_{-\frac{\Delta}{2}}^{\frac{\Delta}{2}} zdt = a \int_{-\frac{\Delta}{2}}^{\frac{\Delta}{2}} d(t)\,dt$$

$$\tilde{z} = \frac{A}{t}\left(t + \frac{\Delta}{2}\right),$$

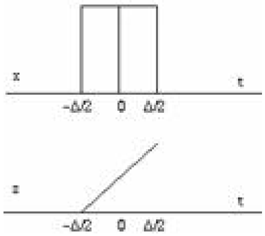
$$\int_{-\frac{\Delta}{2}}^{\frac{\Delta}{2}} \tilde{z}\,dt = \frac{A}{t}\left(\frac{t^2}{2} + \frac{\Delta}{2} t\right) \Big|_{-\frac{\Delta}{2}}^{\frac{\Delta}{2}} = \frac{1}{t}\frac{\Delta^2}{2} \rightarrow \lim_{\Delta \to 0} \frac{1}{t}\frac{\Delta^2}{2} = 0$$

$$t z \Big|_{-\frac{\Delta}{2}}^{\frac{\Delta}{2}} = a \rightarrow \lim_{\Delta \to 0} t z\left(\frac{\Delta}{2}\right) = a \rightarrow z(0) = \frac{a}{t} \quad , z\left(-\frac{\Delta}{2}\right) = 0$$

$$t \frac{dz}{dt} + z = 0 \rightarrow \frac{dz}{z} = \frac{-dt}{t}$$

$$z = A \exp\left(-\frac{t}{t}\right) \Rightarrow z = \frac{a}{t} \exp\left(-\frac{t}{t}\right)$$

$$x(t) = \int x(t')\, d(t - t')\, dt' \rightarrow z(t) = \int x(t') \frac{1}{t} \exp\left(-\frac{|t - t'|}{t}\right) dt'$$



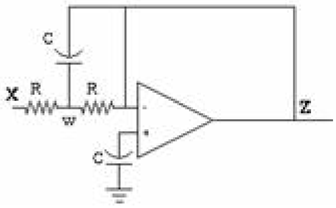
DEL VAJ, KI SLEDI JE PREHITEVAL CAS, VENDAR SIGA VSEENO OGLEDAJTE.

b.) Ce imamo linearno vezje in en vhod in en izhod ter vhodni signal sinusne oblike

$$\hat{p} = \frac{d}{dt} \rightarrow i w \Rightarrow T(\hat{p}) = T(i w)$$

$$|T(i w)| = \left|\frac{1}{1 + i wt}\right| = \frac{1}{\sqrt{1 + (wt)^2}}$$

3.) Kakšen je odziv tega vezja na sinusne signale?



$$\frac{x - w}{R} + \frac{z - w}{R} + C \hat{p}(z - w) = 0$$

$$\frac{w - z}{R} - C \hat{p} z = 0 \rightarrow w = (1 + RC \hat{p}) z$$

$$x - w(2 + RC \hat{p}) + RC \hat{p} z = 0$$

$$x - (1 + RC \hat{p})(2 + RC \hat{p}) z + RC \hat{p} z = 0$$

$$x - (1 + RC \hat{p})^2 z = 0$$

$$\frac{z}{x} = \frac{1}{(1 + RC \hat{p})^2}$$

$$\frac{z}{x} = \frac{1}{(1 + RCi w)^2} = \frac{1}{(1 + i wt)^2}$$

$$\left|\frac{z}{x}\right| = \left|\frac{1}{(1 + i wt)^2}\right| = \frac{1}{1 + w^2 t^2}$$

$$\tan d = \frac{\operatorname{Im} \frac{z}{x}}{\operatorname{Re} \frac{z}{x}} = \frac{2 wt}{1 + w^2 t^2}$$