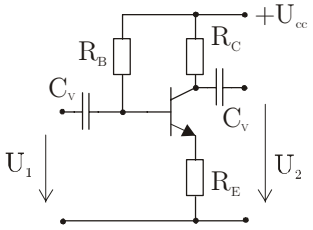
Komunikacijska vezja - rešitve nalog 15.9.2003

1. Izračunajte ojačenje in koeficient nelinearnega popačenja zaradi druge harmonske komponente !



$$Par(R1,R2) := \frac{R1 \cdot R2}{R1 + R2}$$

RB := 330000 Rc := 5000 Re := 1000 U1 := 0.1

Cv := 10^{-6} Ucc := 10 β := 100 Ube0 := 0.6

$$Ie := \frac{Ucc - Ube0}{\frac{RB}{\beta} + Re}$$

Ie = 2.186•10^{-3} gm := 40·Ie $rbe := \frac{\beta}{gm}$

gm = 0.087 rbe = 1.144•10^{3}

$$Au := -gm \cdot Rc \cdot \frac{rbe}{rbe + Re \cdot (\beta + 1)}$$

Au = −4.895

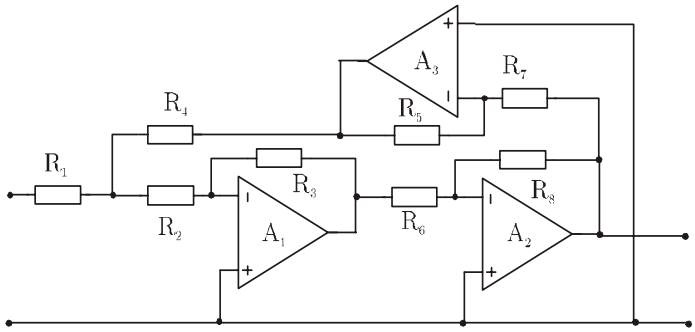
$$Ube := U1 \cdot \frac{rbe}{rbe + Re \cdot (\beta + 1)}$$

k2 := Ube·1000 k2 = 1.12

2. Izračunajte natančno ojačenje ojačevalnika !

R1 := 1 R2 := 1 R3 := 10 R4 := 100 R5 := 10 R6 := 1 R7 := 1 R8 := 50

A := 100



$$T1 := A \cdot \frac{R2}{R2 + R3}$$

T1 = 9.091

$$Ab1 := \frac{\frac{-R3}{R2}}{1 + \frac{1}{T1}}$$

Ab1 = −9.009

$$Rvh1 := R2 + \frac{R3}{1 + A}$$

Rvh1 = 1.099

$T2 := A \cdot \frac{R6}{R6 + R8}$ $T2 = 1.961$ $Ab2 := \frac{\frac{-R8}{R6}}{1 + \frac{1}{T2}}$ $Ab2 = -33.113$

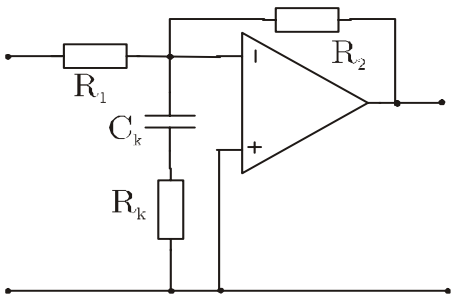
$T3 := A \cdot \frac{R7}{R7 + R5}$ $T3 = 9.091$ $Ab3 := \frac{\frac{-R5}{R7}}{1 + \frac{1}{T3}}$ $Ab3 = -9.009$

$Aoz := \frac{Par(R4, Rvh1)}{R1 + Par(R4, Rvh1)} \cdot Ab1 \cdot Ab2$ $Aoz = 155.378$

$T := -\left[\frac{Par(R1, Rvh1)}{(R4 + Par(R1, Rvh1))} \cdot Ab1 \cdot Ab2 \cdot Ab3\right]$ $T = 13.998$

$Ab := \frac{Aoz}{1 + T}$ $Ab = 10.36$

3. Ojačevalnik kompenzirajte s polom in ničlo tako, da bo fazna varnost 45 stopinj!



$\Phi m := \frac{\pi}{4}$

$R1 := 10000$ $R2 := 100000$

podatki o ojačevalniku:

$A0 := 10^5$

$fp1 := 5 \cdot 10^5$ $fp2 := 5 \cdot 10^6$

$T0 := A0 \cdot \frac{R1}{R1 + R2}$ $T0 = 9.091 \cdot 10^3$ $fzg := fp2$ $fpk := \frac{fzg}{T0}$ $fnk := fp1$

$fpk = 550$ $fnk = 5 \cdot 10^5$

ničla : $\frac{1}{2 \cdot \pi \cdot Ck \cdot Rk}$ pol : $\frac{1}{2 \cdot \pi \cdot Ck \cdot (Rk + R1)}$ $Rk := \frac{R1}{\frac{fnk}{fpk} - 1}$ $Rk = 11.012$

$Ck := \frac{1}{2 \cdot \pi \cdot Rk \cdot fnk}$ $Ck = 2.891 \cdot 10^{-8}$