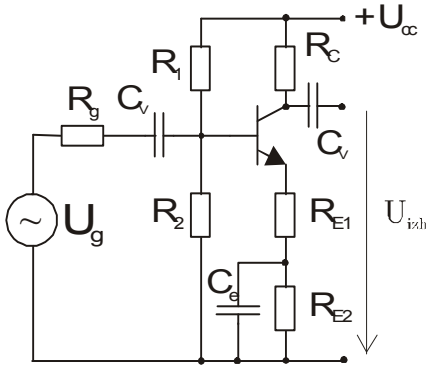
Komunikacijska vezja - rešitve nalog 9.2.2012

1. Izračunajte spodnjo mejno frekvenco in popačenje!



$$Par(R1,R2) := \frac{R1 \cdot R2}{R1 + R2} \qquad Ug := 0.1$$

$R1 := 40000$ $\quad Rc := 5000$

$R2 := 4000$ $\quad Re1 := 200$

$Ce := 50 \cdot 10^{-6}$ $\quad Re2 := 1000$

$Cv := 5 \cdot 10^{-6}$ $\quad Rg := 3000$

$\beta := 100$ $\quad Ucc := 20$ $\quad Ube0 := 0.6$

$RB := Par(R1,R2)$ $\quad RB = 3.636 \cdot 10^{3}$

$$Ie := \frac{Ucc \cdot \frac{R2}{R1 + R2} - Ube0}{Re1 + Re2 + \frac{RB}{\beta + 1}} \qquad Ie = 9.856 \cdot 10^{-4} \qquad gm := 40 \cdot Ie \qquad rbe := \frac{\beta}{gm}$$

$gm = 0.039$ $\quad rbe = 2.537 \cdot 10^{3}$

$Rvh := Par(RB, rbe + Re1 \cdot \beta)$

$Rvh = 3.131 \cdot 10^{3}$

$$A0 := \left(gm \cdot Rc \cdot \frac{rbe}{rbe + \beta \cdot Re1}\right) \cdot \frac{Rvh}{Rvh + Rg} \qquad A0 = 11.33 \qquad 20 \cdot \log(A0) = 21.085$$

$Rnv := (Par(RB, rbe + (Re1 + Re2) \cdot \beta + rbe)) + Rg$ $\quad Rnv = 6.534 \cdot 10^{3}$

$Rne := Par(Re2 \cdot \beta, Re1 \cdot \beta + rbe + Par(RB, Rg))$ $\quad Rne = 1.947 \cdot 10^{4}$

$$fpv := \frac{1}{2 \cdot \pi \cdot Rnv \cdot Cv} \qquad fpv = 4.872$$

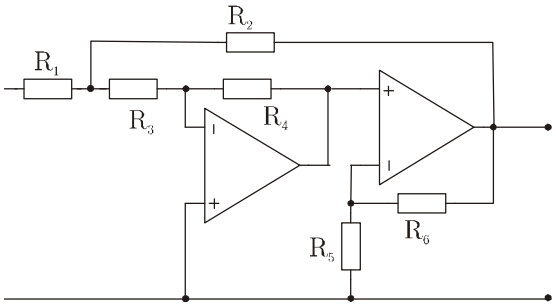
$$fpe := \frac{\beta + 1}{2 \cdot \pi \cdot Ce \cdot Rne} \qquad fpe = 16.511 \qquad fne := \frac{1}{2 \cdot \pi \cdot Re2 \cdot Ce} \qquad fne = 3.183$$

$$Ube := Ug \cdot \left[\left(\frac{rbe}{rbe + \beta \cdot Re1}\right) \cdot \frac{Rvh}{Rvh + Rg}\right] \qquad Ube \cdot (1000) = 5.748$$

popačenje je 5.7%

fsp = fpe: $\quad fpe = 16.511$

2. Izračunajte napetostno ojačenje vezave na sliki !



R1 := 1000 R2 := 25000

R3 := 1000 R4 := 25000

R5 := 1000 R6 := 25000

A1 := 100 A2 := A1

$T1 := A1 \cdot \frac{R3}{R3 + R4}$ $Aoz1 := \frac{R4}{R3 + R4} \cdot A1$ $T2 := A2 \cdot \frac{R5}{R5 + R6}$ $Aoz2 := A2$

T1 = 3.846 Aoz1 = 96.154 T2 = 3.846 Aoz2 = 100

$A\beta1 := \frac{Aoz1}{1 + T1}$ $A\beta1 = 19.841$ $A\beta2 := \frac{Aoz2}{1 + T2}$ $A\beta2 = 20.635$

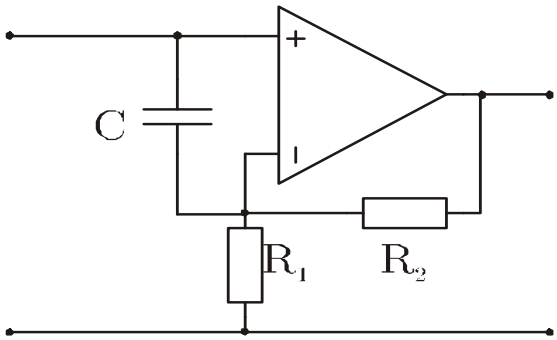
$Rv1 := R3 + \frac{R4}{1 + A1}$ $Rv1 = 1.248 \cdot 10^3$

$T := \frac{Par(R1, Rv1)}{Par(R1, Rv1) + R2} \cdot A\beta1 \cdot A\beta2$ $T = 8.893$

$Aoz := \frac{Par(R2, Rv1)}{R1 + Par(R2, Rv1)} \cdot (A\beta1 \cdot A\beta2)$ $Aoz = 222.321$ $A\beta := \frac{Aoz}{1 + T}$ $A\beta = 22.473$

$Rvh := R1 + \frac{R2}{1 + A\beta1 \cdot A\beta2}$ $Rvh = 1.061 \cdot 10^3$

2. Izračunajte kompenzacijski kondenzator tako, da bo fazna varnost 60stopinj! Izračunajte tudi zgornjo mejno frekvenco ojačevalnika !



$R1 := 1000 \quad R2 := 5000$

podatki o ojačevalniku:

$A0 := 10^{\frac{90}{20}} \qquad C := 470 \cdot 10^{-9}$

$fp1 := 2 \cdot 10^{6} \quad fp2 := 30 \cdot 10^{6}$

$T0 := A0 \cdot \frac{R1}{R1 + R2} \qquad T0 = 5.27 \cdot 10^{3}$

$fzg := \frac{fp1}{\sqrt{3}} \qquad fzg = 1.155 \cdot 10^{6} \qquad fpk := \frac{fzg}{T0} \qquad fpk = 219.089$

$C := \frac{1}{2 \cdot \pi \cdot fpk \cdot Par(R1, R2)} \qquad C = 8.717 \cdot 10^{-7}$