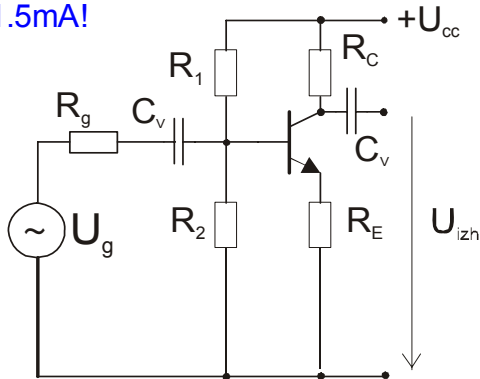


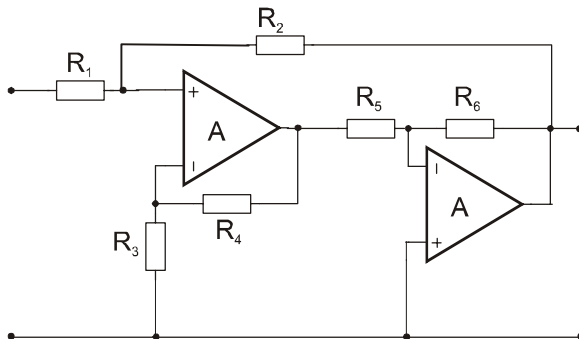
KOMUNIKACIJSKA VEZJA - IZPIT, datum: 15.januar 2008

1. Izračunajte amplitudo druge harmonske komponente na izhodu ojačevalnika! Upor R1 določite tako, da bo mirovni emitorski tok 1.5mA!



$$\begin{aligned}
 R_g &:= 2000 & R_2 &:= 2000 & R_e &:= 1000 & R_C &:= 4000 & C_v &:= 10^{-7} & U_{cc} &:= 12 \\
 \beta &:= 100 & U_{be0} &:= 0.6 & I_{e0} &:= 1.5 \cdot 10^{-3} & U_g &:= 10 \cdot 10^{-3} & & & & \\
 U_B &:= U_{be0} + I_{e0} \cdot R_e & U_B &= 2.1 & & & & & \text{Par}(R_1, R_2) &:= \frac{R_1 \cdot R_2}{R_1 + R_2} \\
 R_1 &:= R_2 \cdot \left(\frac{U_{cc}}{U_B} - 1 \right) & R_1 &= 9.429 \cdot 10^3 & & & & & & & & \\
 R_B &:= \text{Par}(R_1, R_2) & R_B &= 1.65 \cdot 10^3 & g_m &:= 40 \cdot I_{e0} & r_{be} &:= \frac{\beta}{g_m} & R_{vh} &:= \text{Par}(R_B, r_{be} + R_e \cdot (\beta + 1)) \\
 & & & & & & R_{vh} &= 1.624 \cdot 10^3 & & & & \\
 A_u &:= -g_m \cdot R_C \cdot \frac{r_{be}}{r_{be} + R_e \cdot (\beta + 1)} \cdot \frac{R_{vh}}{R_{vh} + R_g} & A_u &= -1.746 & & & & & & & & \\
 k_2 &:= 1000 \cdot U_g \cdot \left[\frac{r_{be}}{r_{be} + R_e \cdot (\beta + 1)} \cdot \frac{R_{vh}}{R_{vh} + R_g} \right] & k_2 &= 0.073 & U_{2\omega} &:= U_g \cdot A_u \cdot \frac{k_2}{100} & U_{2\omega} &= -1.27 \cdot 10^{-5}
 \end{aligned}$$

2. Izračunajte natančno vhodno upornost in ojačenje ojačevalnika!



$$R_1 := 1000 \quad R_2 := 20000 \quad R_3 := 1000 \quad R_4 := 100000 \quad R_5 := 2000 \quad A := 1000 \quad R_6 := 2000$$

$$T1 := A \cdot \frac{R3}{R3 + R4} \quad T1 = 9.901 \quad Ab1n := 1 + \frac{R4}{R3} \quad Aoz2 := -A \cdot \frac{R5}{R5 + R6} \quad T2 := A \cdot \frac{R6}{R6 + R5}$$

$$Ab1 := \frac{Ab1n}{1 + \frac{1}{T1}} \quad Ab1 = 91.735 \quad Ab2 := \frac{Aoz2}{1 + T2} \quad Ab2 = -0.998$$

$$A12 := Ab1 \cdot Ab2 \quad A12 = -91.552$$

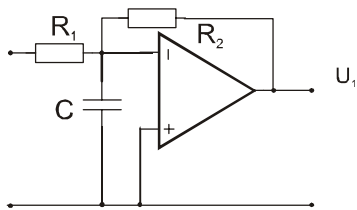
$$Rvh := R1 + \frac{R2}{1 - A12} \quad Rvh = 1.216 \cdot 10^3$$

$$T := \frac{-R1}{R1 + R2} \cdot A12 \quad Aoz := \frac{R2}{R1 + R2} \cdot A12 \quad T = 4.36 \quad Aoz = -87.192$$

$$Ab := \frac{Aoz}{1 + T} \quad Ab = -16.268$$

3. Izračunajte zgornjo mejno frekvenco in fazno varnost ojačevalnika!

$$A0 := 10^5 \quad fp1 := 10^6 \quad fp2 := 2 \cdot 10^7 \quad C := 10^{-7} \quad R1 := 10000 \quad R2 := 100000$$



$$fd := \frac{1}{2 \cdot \pi \cdot C \cdot \text{Par}(R1, R2)} \quad T0 := \frac{R1}{R1 + R2} \cdot A0$$

$$fd = 175.07 \quad T0 = 9.091 \cdot 10^3$$

$$T0 \cdot fd = 1.592 \cdot 10^6 \quad \text{točka } |T|=1 \text{ se nahaja malo nad } fp1 \text{ (3. segment)}$$

$$fzg := \sqrt{T0 \cdot fd \cdot fp1} \quad fzg = 1.262 \cdot 10^6$$

$$\arg T := -\text{atan}\left(\frac{fzg}{fd}\right) \cdot \frac{180}{\pi} - \left(\text{atan}\left(\frac{fzg}{fp1}\right) \cdot \frac{180}{\pi}\right) - \text{atan}\left(\frac{fzg}{fp2}\right) \cdot \frac{180}{\pi}$$

$$\arg T = -145.199 \quad \Phi M := 180 + \arg T \quad \Phi M = 34.801$$