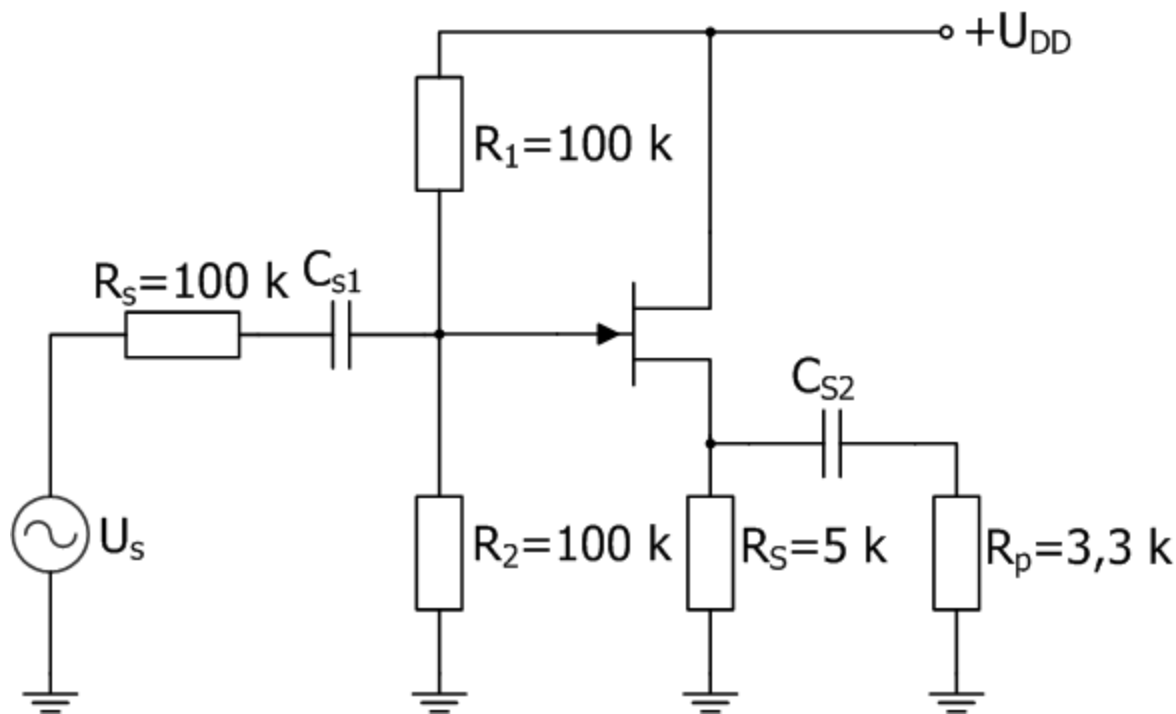


Elektronika

Auditorne vježbe 12

Zadatak 45.

- Odrediti naponsko pojačanje te ulazne i izlazne otpore tranzistora i sklopa za pojačalo prikazano na slici. Poznato je: $g_m = 3 \text{ mA/V}$, $g_d = 30 \cdot 10^{-6} \text{ S}$.



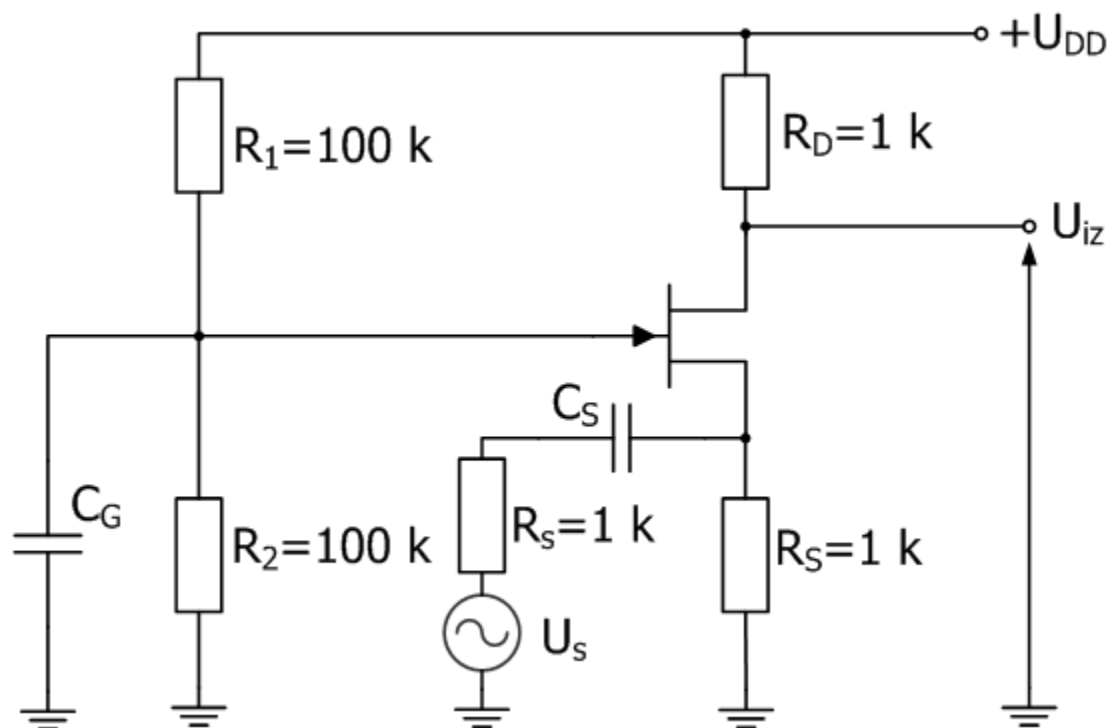
Zadatak 45.

✓ Rješenje:

- 1) $A_V = 0,85$
- 2) $R_{ul} \rightarrow \infty; R_{ul}' = R_G = 50 \text{ k}\Omega$
- 3) $R_{iz} = 330 \text{ }\Omega; R_{iz}' = 310 \text{ }\Omega$

Zadatak 46.

- Odrediti naponsko pojačanje te ulazne i izlazne otpore tranzistora i sklopa za pojačalo prikazano na slici. Poznato je: $r_d = 10 \text{ k}\Omega$, $\mu = 30$.



Zadatak 46.

✓ Rješenje:

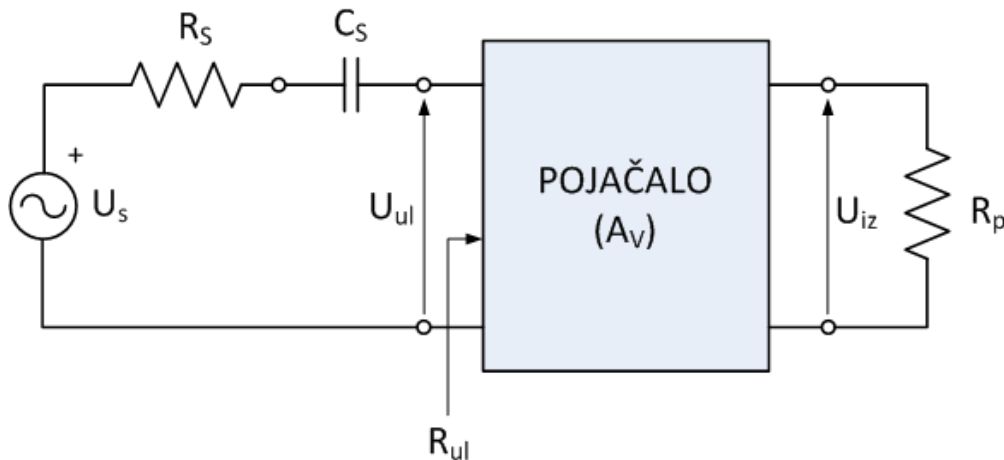
1) $A_V = 2,82$

2) $R_{ul} = 355 \, \Omega$; $R_{ul}' = 262 \, \Omega$

3) $R_{iz} = 25,5 \, k\Omega$; $R_{iz}' = 962 \, \Omega$

Pojave pri niskim frekvencijama

- Utjecaj veznih kondenzatora.
- Smanjuje se naponsko pojačanje A_V .
- Pojava linearnih izobličenja.



$$A_{VS} = \frac{U_{iz}}{U_s} = \frac{U_{iz}}{U_{ul}} \cdot \frac{U_{ul}}{U_s} = A_V \cdot \frac{U_{ul}}{U_s}$$

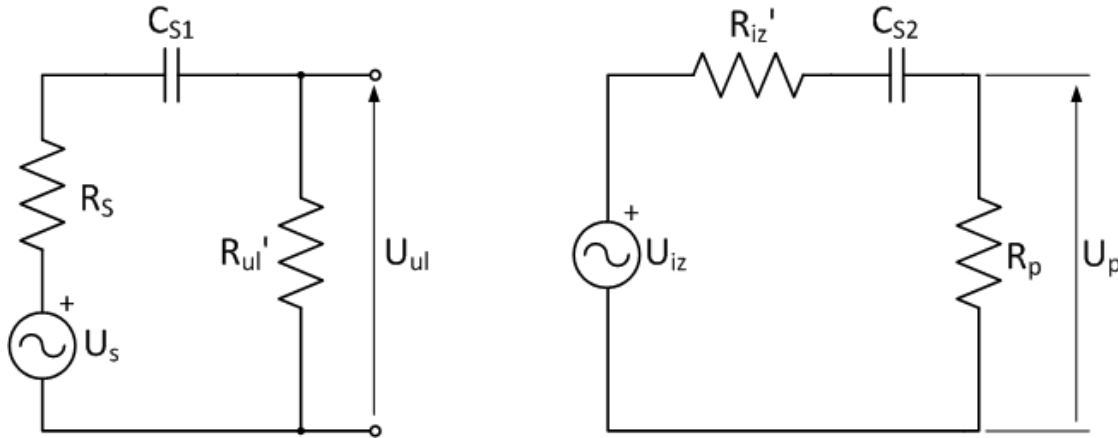
$$\frac{U_{ul}}{U_s} = \frac{R_{ul}'}{R_s + R_{ul}' + \frac{1}{j\omega C_s}}$$

$$f_d = \frac{1}{2\pi \cdot C_s (R_s + R_{ul}')}$$

$$\phi = \arctg\left(\frac{f_d}{f}\right)$$

POJAVE PRI NISKIM FREKVENCIJAMA

- U slučaju postojanja dviju donjih graničnih frekvencija:

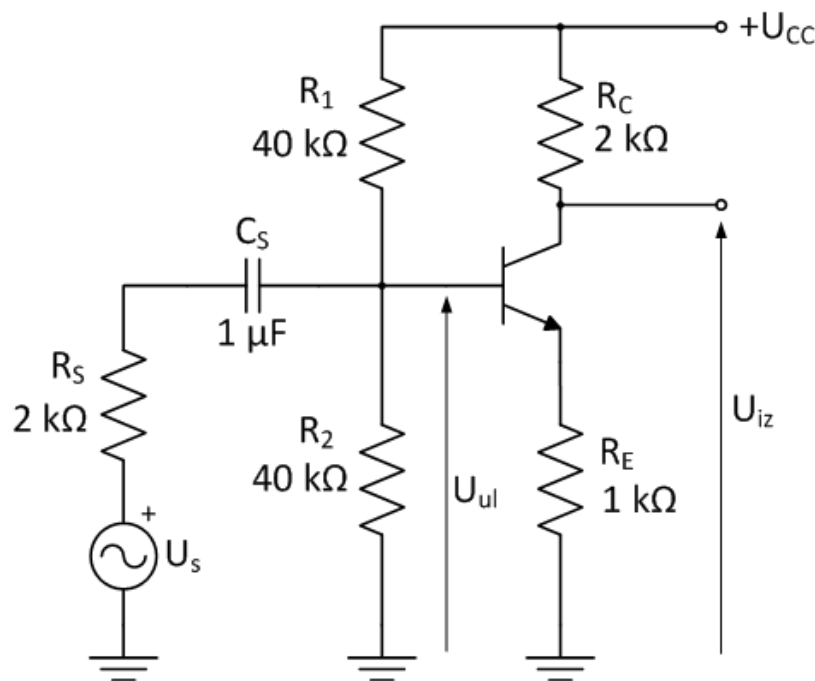


$$A_{VS} = \frac{U_p}{U_s} = \frac{U_p}{U_{iz}} \cdot \frac{U_{iz}}{U_{ul}} \cdot \frac{U_{ul}}{U_s} = A_V \cdot \frac{U_{ul}}{U_s} \cdot \frac{U_p}{U_{iz}}$$

$$f_d = \sqrt{\frac{f_{d1}^2 + f_{d2}^2}{2}} + \sqrt{\left(\frac{f_{d1}^2 + f_{d2}^2}{2}\right)^2 + (f_{d1} \cdot f_{d2})^2} \quad \phi = \phi_1 + \phi_2$$

Zadatak 47.

- Odrediti donju graničnu frekvenciju i fazni pomak na $f=10$ Hz za pojačalo prikazano na slici. Zadani su h-parametri: $h_{ie}=1\text{ k}\Omega$, $h_{re}=2\cdot 10^{-4}$, $h_{fe}=100$, $h_{oe}=25\text{ }\mu\text{S}$.



Zadatak 47.

✓ Rješenje:

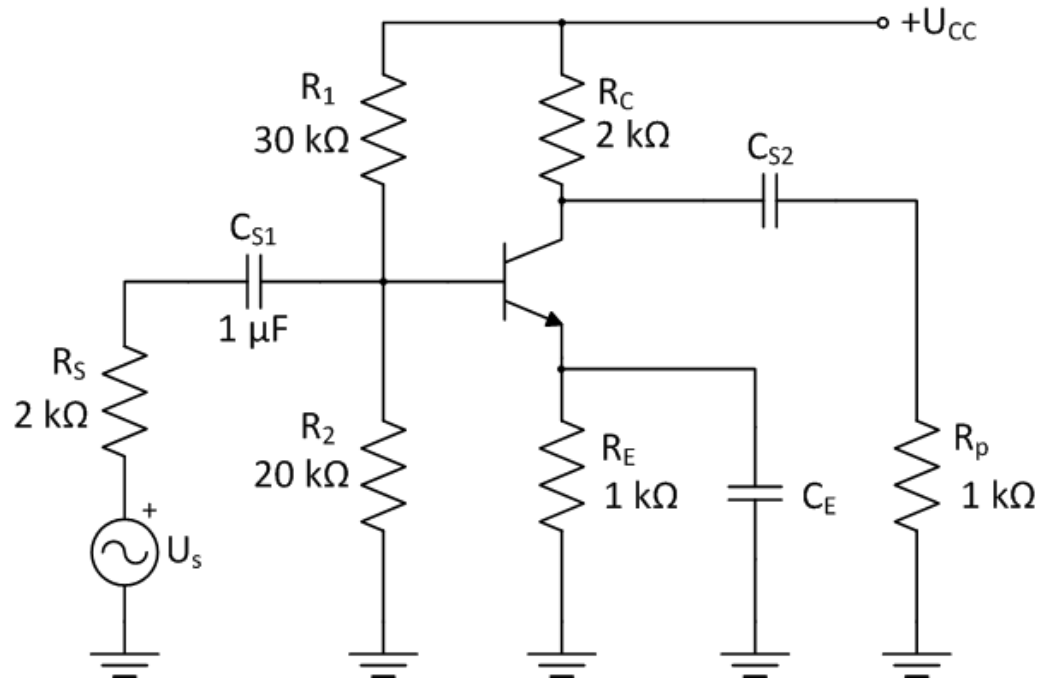
- $R_B = 20 \text{ k}\Omega$;
- $A_i = -100$;
- $R_{ul} = 102 \text{ k}\Omega$; $R_{ul}' = 16,7 \text{ k}\Omega$;
- $f_d = 8,5 \text{ Hz}$; $\varphi = 40,4^\circ$; $\varphi_{uk} = 220,4^\circ$.

Zadatak 48.

- Odrediti donju graničnu frekvenciju i fazni pomak na $f=30$ Hz za pojačalo prikazano na slici. Zadani su h-parametri: $h_{ie}=1\text{ k}\Omega$, $h_{re}=2\cdot 10^{-4}$, $h_{fe}=100$, $h_{oe}=25\text{ }\mu\text{S}$.

a) $C_{S2}=5\text{ }\mu\text{F}$;

b) $C_{S2}=1\text{ }\mu\text{F}$.



Zadatak 48.

✓ Rješenje:

- $R_B = 12 \text{ k}\Omega$; $R_p' = 0,67 \text{ k}\Omega$; $R_s' = 1,71 \text{ k}\Omega$;
- $A_l = -98,4$;
- $R_{ul} = 987 \text{ }\Omega$; $R_{ul}' = 912 \text{ }\Omega$; $f_{d1} = 54,7 \text{ Hz}$; $\varphi_1 = 61,3^\circ$.
- $R_{iz} = 56,7 \text{ k}\Omega$; $R_{iz}' = 1,93 \text{ k}\Omega$;

a) $f_{d2} = 10,9 \text{ Hz}$; $\varphi_2 = 20^\circ$.

$$f_d \approx f_{d1} = 54,7 \text{ Hz}; \varphi_{uk} = \varphi_1 + \varphi_2 + 180^\circ = 261,3^\circ.$$

b) $f_{d2} = 54,3 \text{ Hz}$; $\varphi_2 = 61^\circ$.

$$f_d = 84,7 \text{ Hz}; \varphi_{uk} = \varphi_1 + \varphi_2 + 180^\circ = 302,3^\circ.$$