

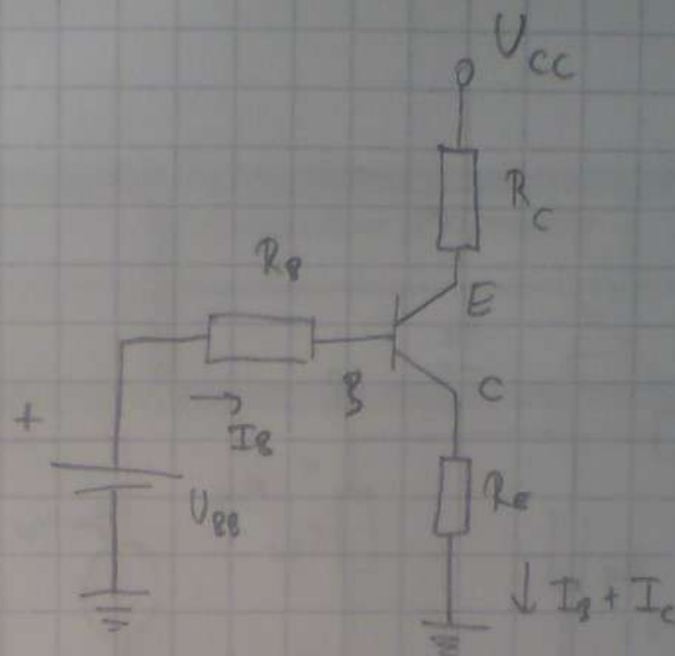
$$\beta = h_{fe} = 100, C_E = 0$$

$$R_1 = 8,2 \text{ k}\Omega$$

$$R_2 = 3,3 \text{ k}\Omega$$

$$R_C = 1,8 \text{ k}\Omega$$

$$R_E = 390 \Omega$$



NADOMJESTNA SKEMA

ZA STAT. ANALIZU

$$U_{BB} = \frac{R_2}{R_1 + R_2} U_{CC} = 3,443 \text{ V}$$

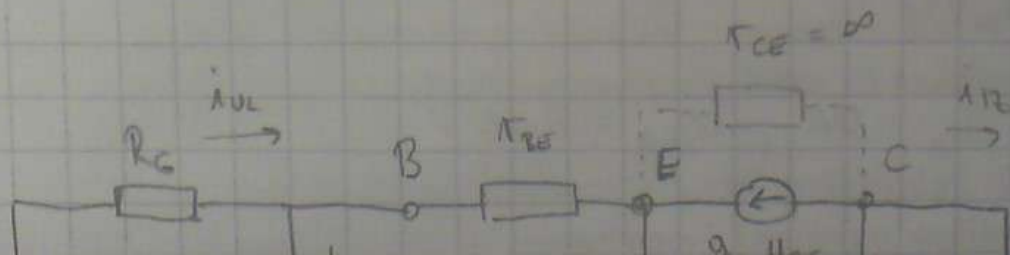
$$I_{CQ} = \beta I_{BQ} = 2,934 \cdot 10^{-3} \text{ A}$$

$$R_B = R_1 \parallel R_2 = 2,353 \text{ k}\Omega$$

$$U_{CEQ} = U_{CC} - (R_C + R_E) I_{CQ} = 4,427 \text{ V}$$

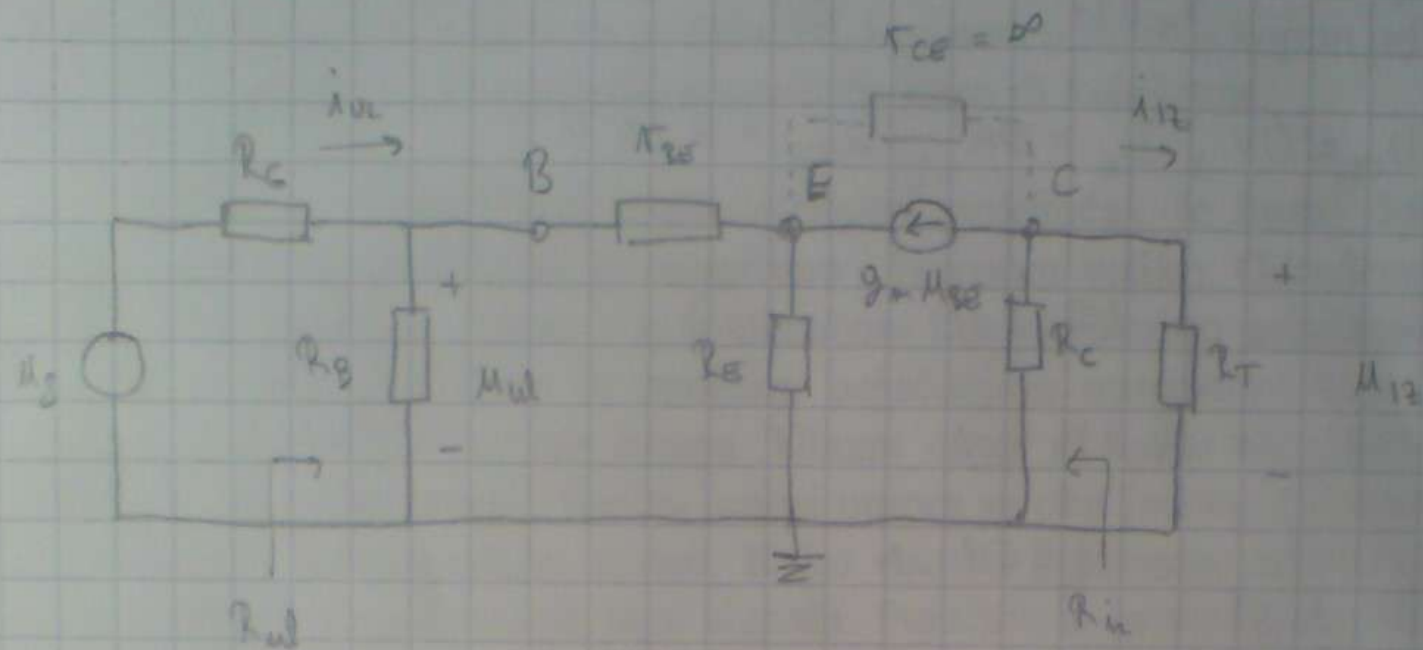
$$I_{BQ} = \frac{U_{BB} - U_{BEQ}}{R_B + (1 + \beta) R_E} = 2,934 \cdot 10^{-5} \text{ A}$$

a)



$C_E = 0$

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$$C_E = 0$$

$$X_C = -j \frac{1}{\omega C} = \infty$$

→ EMITERIA DEGENERASI

$$u_{ce} = -i_c (R_C \parallel R_L) - i_c R_E = -i_c (R_E + R_C \parallel R_L)$$

$$U_{ce} = U_{ceQ} + \Delta U_{ce} = U_{ceQ} + I_{cq} (R_E + R_C \parallel R_L) = 9,837 \text{ V}$$

$$i_c = I_{cq} + \Delta i_c = I_{cq} + \frac{U_{ceQ}}{(R_C \parallel R_L + R_E)} = 5,473 \text{ mA}$$

$$I_{CB} \approx 5,5 \text{ mA}, U_{CB} \approx 0 \text{ V}, U_{CEA} = 8,84 \text{ V}, I_{CA} = 0 \text{ A}$$

$$U_{CE \max} = U_{CE} - U_{CEA} = 4,41 \text{ V}$$

$$I_{CE \max} = I_{CB} - I_{CA} = 2,7 \text{ mA}$$

$$u_{CE} = -i_c (R_c \parallel R_T) - i_c R_E = -i_c (R_E + R_c \parallel R_T)$$

$$u_{CE} = u_{CEQ} + \Delta u_{CE} = u_{CEQ} + I_{CQ} (R_E + R_c \parallel R_T) = 8,837 \text{ V}$$

$$i_c = I_{CQ} + \Delta i_c = I_{CQ} + \frac{u_{CEQ}}{(R_c \parallel R_T + R_E)} = 5,473 \text{ mA}$$

$$I_{CB} \approx 5,5 \text{ mA}, \quad U_{CB} \approx 0 \text{ V}, \quad U_{CEA} = 8,84 \text{ V}, \quad I_{CA} = 0 \text{ A}$$

$$U_{CE \max} = U_{CE} - U_{CEQ} = 4,41 \text{ V}$$

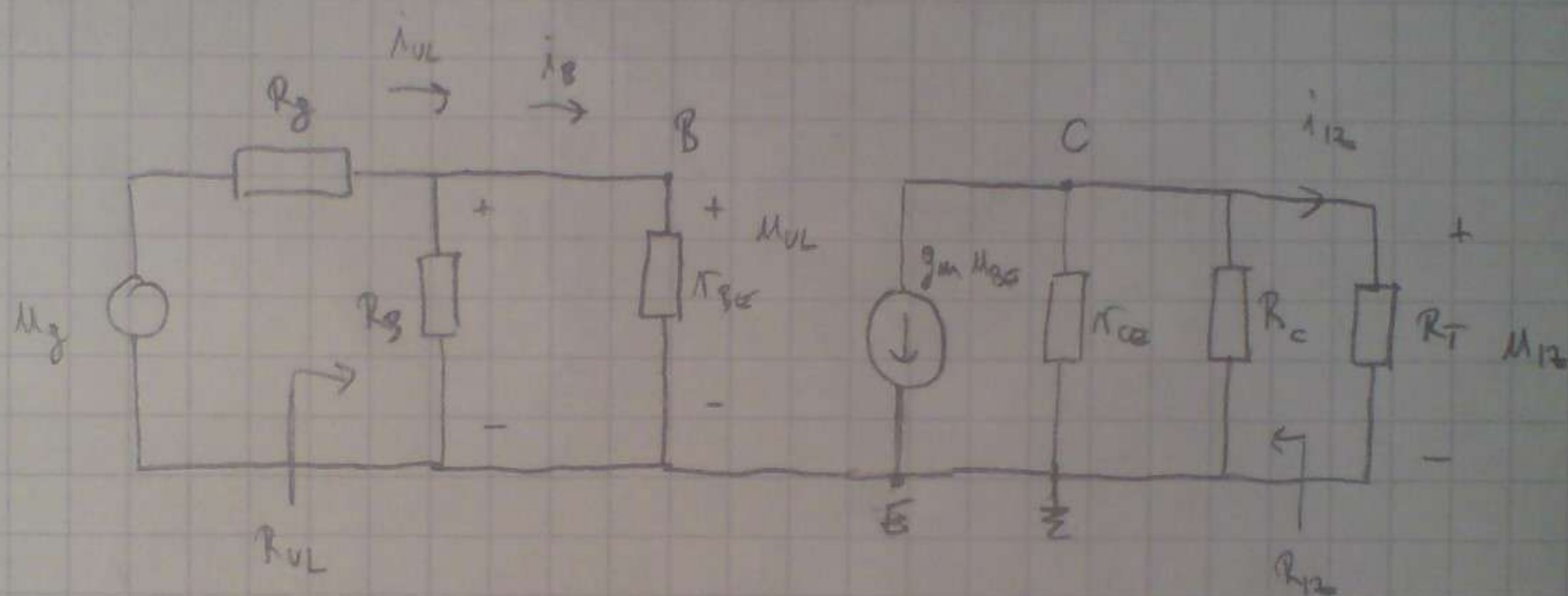
$$I_{CE \max} = I_{CQ} - I_{CA} = 2,7 \text{ mA}$$

$$I_{R \max} = I_{CE \max} \frac{R_c}{R_c + R_T} = 1,736 \text{ mA}$$

$$U_{R \max} = U_{CE \max} = 4,41 \text{ V}$$

$$A) C_C = \infty$$

$$X_C = -j \frac{1}{\omega C} = 0$$



$$u_{ce} = -i_c (R_c \parallel R_L)$$

$$u_{ce} = U_{CEQ} + I_{CQ} (R_c \parallel R_L) = 6,185 \text{ V}$$

$$i_c = I_{CQ} + \Delta i_c = I_{CQ} + \frac{U_{CEQ}}{R_c \parallel R_L} = 9,62 \text{ mA}$$

$$I_{CQ} = 9,62 \text{ mA}, U_{CE} \approx 0 \text{ V}, I_{CA} = 0 \text{ A}, U_{CEA} = 6,185 \text{ V}$$

$$u_{ce} = -i_c (R_c \parallel R_T)$$

$$u_{ce} = U_{ceQ} + I_{cQ} (R_c \parallel R_T) = 6,185 \text{ V}$$

$$i_c = I_{cQ} + \Delta i_c = I_{cQ} + \frac{U_{ceQ}}{R_c \parallel R_T} = 9,62 \text{ mA}$$

$$I_{cQ} = 9,62 \text{ mA}, \quad U_{ce} \approx 0 \text{ V}, \quad I_{cA} = 0 \text{ A}, \quad U_{ceA} = 6,185 \text{ V}$$

$$U_{ce \max} = U_{ceA} - U_{ceQ} = 1,758 \text{ V}$$

$$I_{ce \max} = I_{cQ} - I_{cA} = 2,734 \text{ mA}$$

$$I_{iz \max} = I_{c \max} \frac{R_c}{R_c + R_T} = 1,758 \text{ mA}$$

$$U_{iz \max} = U_{ce \max} = 1,758 \text{ V}$$

$$V_{Iz \max} = V_{CE \max} = 17,58 \text{ V}$$

3. a) $C_E \rightarrow \infty \Rightarrow X_C = -j \frac{1}{\omega C} = 0$

$$R_{UL} = R_B \parallel r_{BE} =$$

$$r_{BE} = \frac{U_T}{I_{BQ}} = 914,4 \Omega$$

$$R_{UL} = 658,5 \Omega$$

$$g_m = \frac{h_{fe}}{r_{BE}} = 0,10936 \text{ A/V}$$

$$A_v = -g_m (R_C \parallel R_T) = -70,3$$

$$A_i = -h_{fe} \frac{R_C}{R_C + R_T} \cdot \frac{R_B}{R_B + r_{BE}} = -46,3$$

$$R_{Iz} = R_C = 1,8 \text{ k}\Omega$$

$$A_{vg} = A_v \frac{R_{UL}}{R_g + R_{UL}} = -27,91$$

b) $C_E < 0 \rightarrow$

$$R_{UL} = R_B \parallel$$

$$R_{UL} = 2,23 \text{ k}\Omega$$

$$R_{Iz} = R_C =$$

$$A_v = -h_{fe} \frac{1}{r_{BE}}$$

$$A_i = -h_{fe} \frac{R_C}{R_C + R_T}$$

$$A_i = -1,49$$

$$A_{vg} = A_v \frac{R_{UL}}{R_g + R_{UL}}$$

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$$b) C_E = 0 \rightarrow X_C = \infty$$

$$R_{UL} = R_B \parallel [r_{BE} + (1 + h_{FE}) R_E]$$

$$R_{UL} = 2,238 \text{ k}\Omega$$

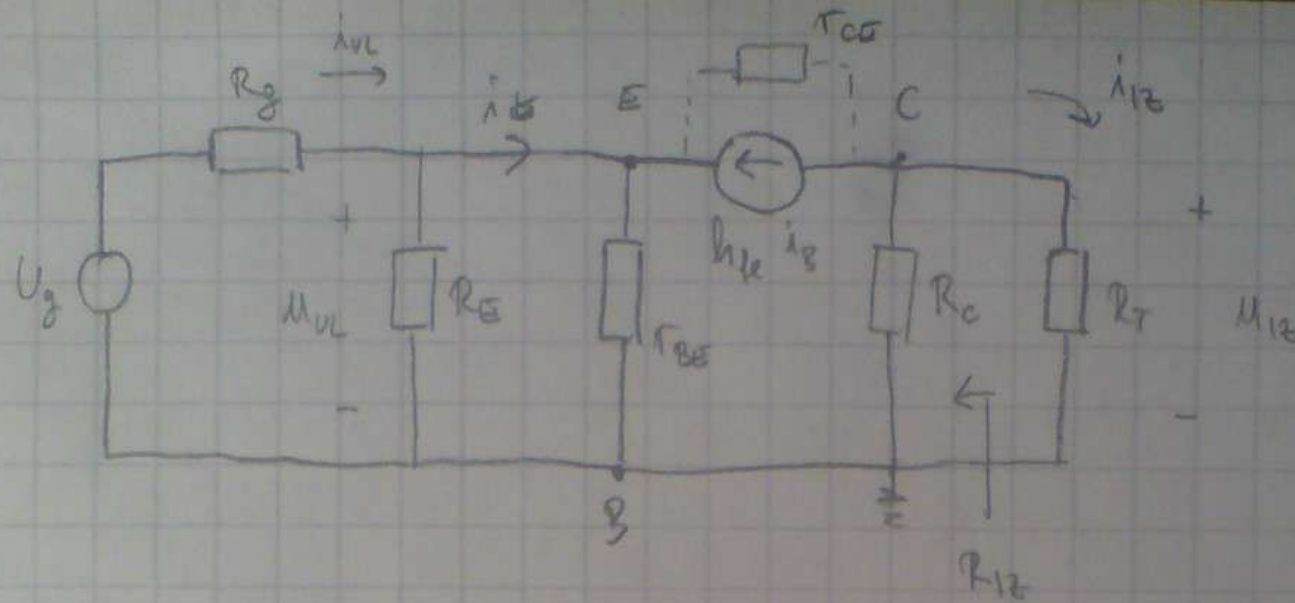
$$R_{L2} = R_C = 1,8 \text{ k}\Omega$$

$$A_V = -h_{FE} \frac{R_C \parallel R_T}{r_{BE} + (1 + h_{FE}) R_E} = -0,65$$

$$A_E = -h_{FE} \frac{R_C \cdot R_E}{(R_C + R_T)(R_B + r_{BE} + (1 + h_{FE}) R_E)}$$

$$A_E = -1,49$$

$$A_{vg} = A_V \frac{R_{UL}}{R_S + R_{UL}} = -0,45$$



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SKLOPA U SPOJU
ZAJONICKE BAZE

$$R_{UL} = R_E \parallel \frac{r_{BE}}{1+h_{FE}} = 8,99 \Omega$$

$$A_v = g_m (R_C \parallel R_T) = 70,3$$

$$A_I = \frac{h_{FE}}{1+h_{FE}} \cdot \frac{R_C}{R_C+R_T} \cdot \frac{R_E}{R_E + \frac{r_{BE}}{1+h_{FE}}} = 0,63$$

$$R_{L2} = R_C = 1,8 k\Omega$$

$$A_{vg} = A_v \frac{R_{UL}}{R_{UL}+R_g} = 0,62$$

Tablica 1. Brojčani rezultati zadatka za pripremu.

SZE						
	Max. hod	R_{ul}	A_V	A_I	A_{Vg}	R_{iz}
$R_T = 1 \text{ k}\Omega$ $C_E = 0$	4,41 V	2298 Ω	-0,65	-1,43	-0,45	1800 Ω
$R_T = 1 \text{ k}\Omega$ $C_E = \infty$	1,758 V	658,5 Ω	-70,3	-46,3	-27,31	1800 Ω

SZB				
R_{ul}	A_V	A_I	A_{Vg}	R_{iz}
8,97 Ω	70,3	0,63	0,62	1800 Ω