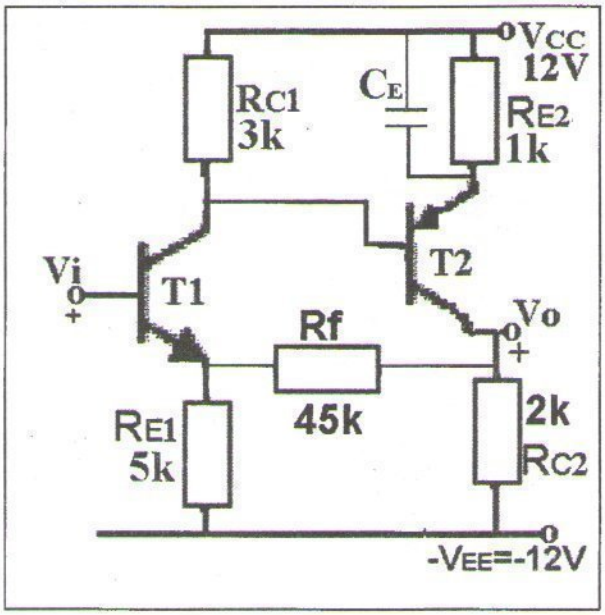
For transistors in the circuit
β_F=100, $|V_{BE}|$=0.6V V_T=25mV
F_{T1}=100MHz C_{be1}=130pF
F_{T2}=50MHz C_{be2}=650pF
are given.

In DC case;
Vi=0V $I_{C1}\approx$2.3mA $I_{C2}\approx$5.7mA

The load at the output : R_L=10k C_L=0,5nF
(The load does not affect DC values in the circuit)

Investigate vo/vi for peak behaviour.

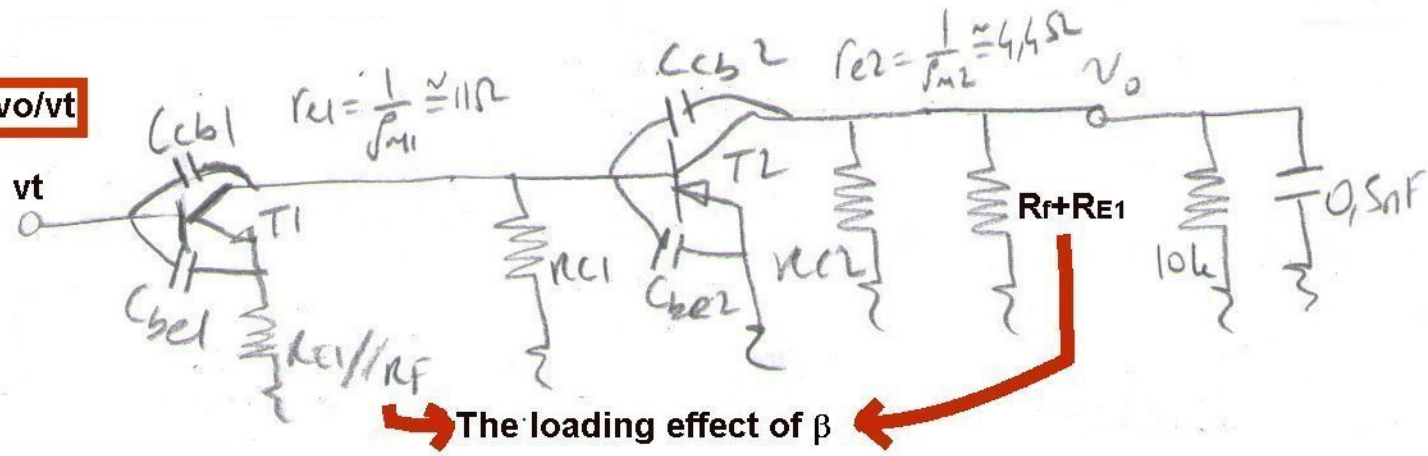
F_T is the transition frequency of a transistor.
At this frequency, current gain is 1.
F_T is given approximately; $FT=gm/2\pi(C_{be}+C_{cb})$



input voltage, output voltage

β: $\rightarrow \beta = -\frac{1}{10}$

A=vo/vt

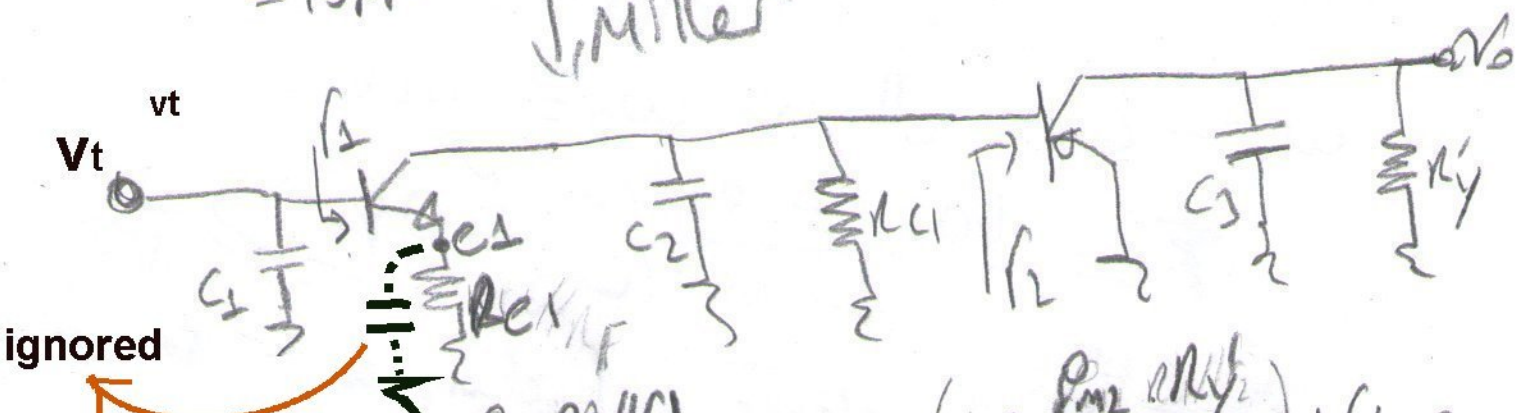


The loading effect of β

$$C_{cb1} = \frac{1}{2\pi r_{e1} \cdot F_{T1}} - C_{be1} \cong 15pF$$

$$C_{cb2} = \frac{1}{2\pi r_{e2} F_{T2}} - C_{be2} \cong 73pF$$

↓Miller



ignored

$$C_2 = C_{cb1}\left(1 + \frac{g_{m1} \cdot R_{e1} \| r_2}{1 + g_{m1} R_{e1}}\right) + C_{cb2}\left(1 + \frac{g_{m2} \cdot R'_y}{1 + g_{m2} R'_y}\right) + C_{be2}$$

$$C_J = C_{cb2}\cdot\left(1 + \frac{1}{g_m R'_y}\right) + 0,5nF$$

$r_2 = \beta_F r_{e2} = 440\,\Omega \rightarrow R_{C1} // r_2 \cong 380\,\Omega$

$R_{e1} = R_{E1} // R_F = 4{,}5k$

$C_2 = 28{,}4nF \quad C_3 \cong 0{,}57nF$

(C1 is not effective for vo/vi)

$R_2 = R_{C1} // r_2$ $\quad R_3 = R_y'$ $\quad \omega_{H2}$

$\omega_{K1} = \frac{1}{R_2 C_2} = 92{,}7k$ $\quad \omega_{K2} = \frac{1}{R_3 C_3} = 1{,}06M$

ω_{H1}

$A_o \leftarrow K_o = -\frac{g_{m1} R_{C1} // r_2}{1 + g_{m1} R_{e1}} \times -g_{m2} \cdot R_y \cong 32$

(vo/vt) $A = K_o \cdot \frac{\omega_{K1}}{s + \omega_{K1}} \cdot \frac{\omega_{K2}}{s + \omega_{K2}}$ $\quad \beta = -\frac{1}{10}$

(vo/vi)

$A_F(s) \cong \frac{32 \times 92{,}7k \times 1{,}06M}{s^2 + 1{,}15M\,s + 4{,}12 \cdot 10^{11}}$

$\omega_o^2 = 4{,}12 \cdot 10^{11} \rightarrow \omega_o = 642k$

$Q = \frac{1{,}06M + 92{,}7k}{2 \times 642k} \cong 0{,}9 \leq \frac{1}{\sqrt{2}}$

There is no peak on the gain function vo/vi

Alternative investigation

$1 - \beta_o A_o \leq \frac{(f_{K1} + f_{K2})^2}{2 f_{K1} f_{K2}} \rightarrow 4{,}2 \leq 6{,}7$

($A_o \rightarrow K_o$)

no peak