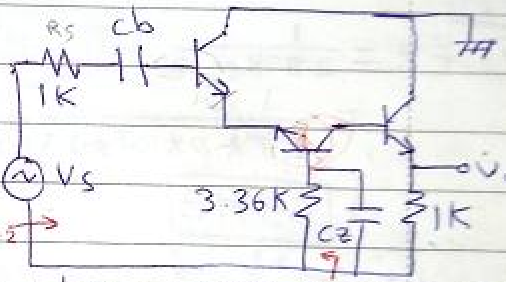
Ex. For the cct. shown, The transistors are identical and having the following parameters $h_{ie} = 1K\Omega$, $h_{fe} = 50$, $h_{re} = h_{oe} = 0$. $C_b = 0.1\mu F$, $C_Z = 4.7\mu F$

(a) Find $\frac{A_{VS}}{A_{VSo}}$

(b) Estimate the lower 3dB freqy

Ans.



(a) $f_Z = 1/2\pi * 3.36*10^3 * 4.7*10^{-6}$

$= 10\ HZ$

$f_{P1} = 1/2\pi [3.36K // (h_{ie} + h_{ie} + 1K)] * 4.7*10^{-6}$

$= 21.36\ HZ$

$f_{P2} = 1/2\pi * 0.1*10^{-6} * (1K + h_{ie} + h_{ie}) = 530.5\ HZ$

$\alpha = f_{P1}/f_Z = 2.1$

$\therefore \frac{A_{VS}}{A_{VSo}} = \frac{1}{2.1} \frac{(1 + j\, f/10)}{(1 + jf/21.3)(1 - j530.5/f)}$

(b) Since $f_{P2} \gg$ from the others by more than 2 octaves then $f_L = f_{P2}$.

$0.707 = 10\sqrt{\frac{(1 + f^2/3^2)}{(1 + f^2/13^2)(1 + 5^2/f^2)}}$

$\left|\frac{A_{VS}}{A_{VSo}}\right| = \frac{10(1 + j\, f/3)}{(1 + j f/13)(1 - j5/f)}$

2.6 High freqy responce of two stage CE transistor:

$r_{bb'} = 100\Omega$

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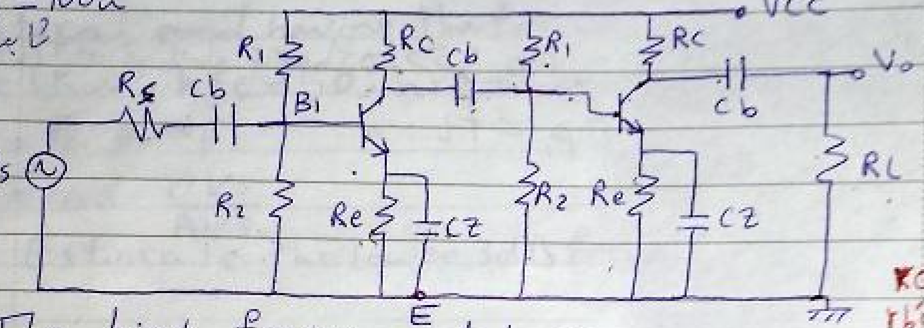
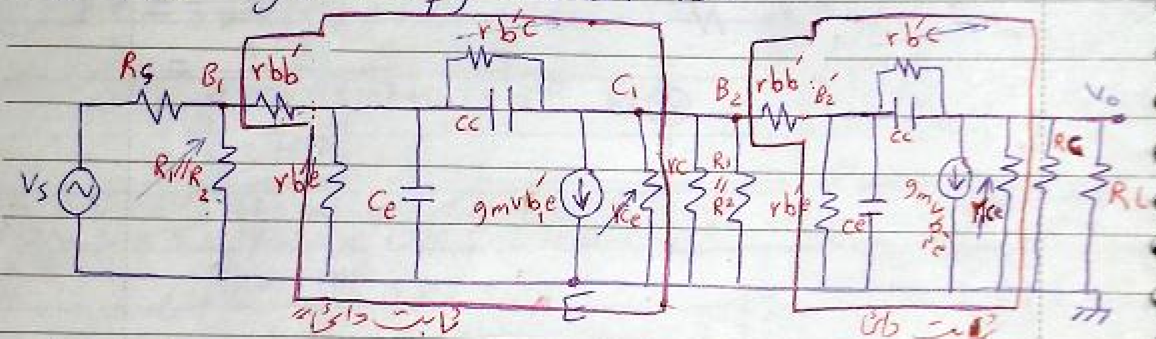


$r_{Ce} = 80k$

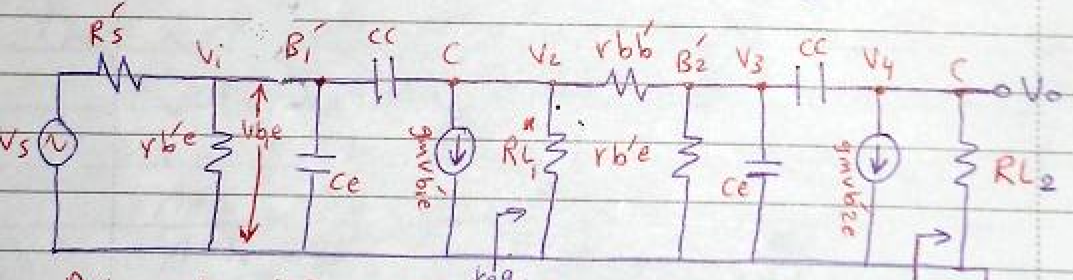
$r_{b'c} = 1M$

* The high freqy model is:



* Usually $RL \leq 2K\Omega$, and since $R_{b'c}$, r_{ce} are very large compared with RL so they can be Neglected.

Take $R_1 // R_2 \gg R_i$ so they can be neglected too.



$RL_1 = R_1 // R_2 // RC$, $RL_2 = RC // RL$

$R_s' = R_s + r_{bb'}$, $V_{b'_1e} = V_1$, $V_{b'_2e} = V_2$

$V_4 = V_o$, V_o?

$req_1 = RL_1 // (r_{bb'} + r_{b'e})$ $\quad req_2 = RL_2$

$(V_1 - V_s)\,1/R'_s + V_1(1/r_{b'e} + 1/X_{ce}) + (V_1 - V_2)\,1/X_{cc} = 0$ ...... ①

$(V_2 - V_1)\,1/X_{cc} + g_m V_1 + V_2\,1/R_{L_1} + (V_2 - V_3)\,1/r_{bb'} = 0$ ...... ②

$(V_3 - V_2)\,1/r_{bb'} + V_3(1/r_{b'e} + 1/X_{ce}) + (V_3 - V_4)\,1/X_{cc} = 0$ ...... ③

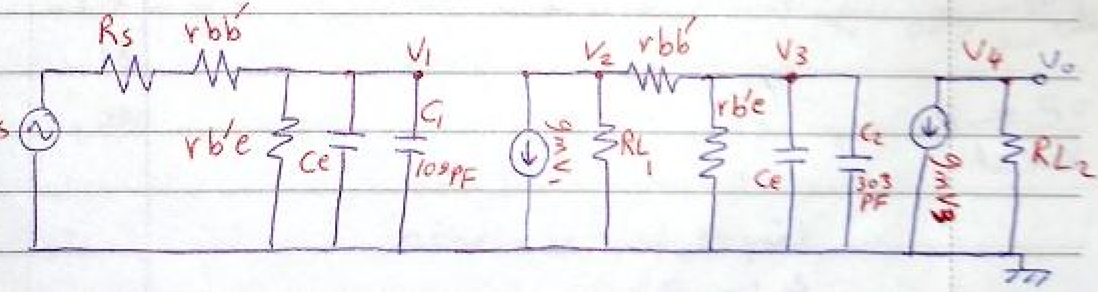
$(V_4 - V_3)\,1/X_{cc} + g_m V_3 + V_4\,1/R_{L_2} = 0$ ...... ④

Solving and find V_o?

2.7 Two stage Cascade Simplify Analysis:

It is approximated by using Miller's theorem, C_c of Q_2 is replaced by $C_c(1+g_m R_{L_2})$ and C_c of Q_1 are replaced by $C_c(1+g_m * R_{L_1} // (r_{b'e}+r_{bb'}))$

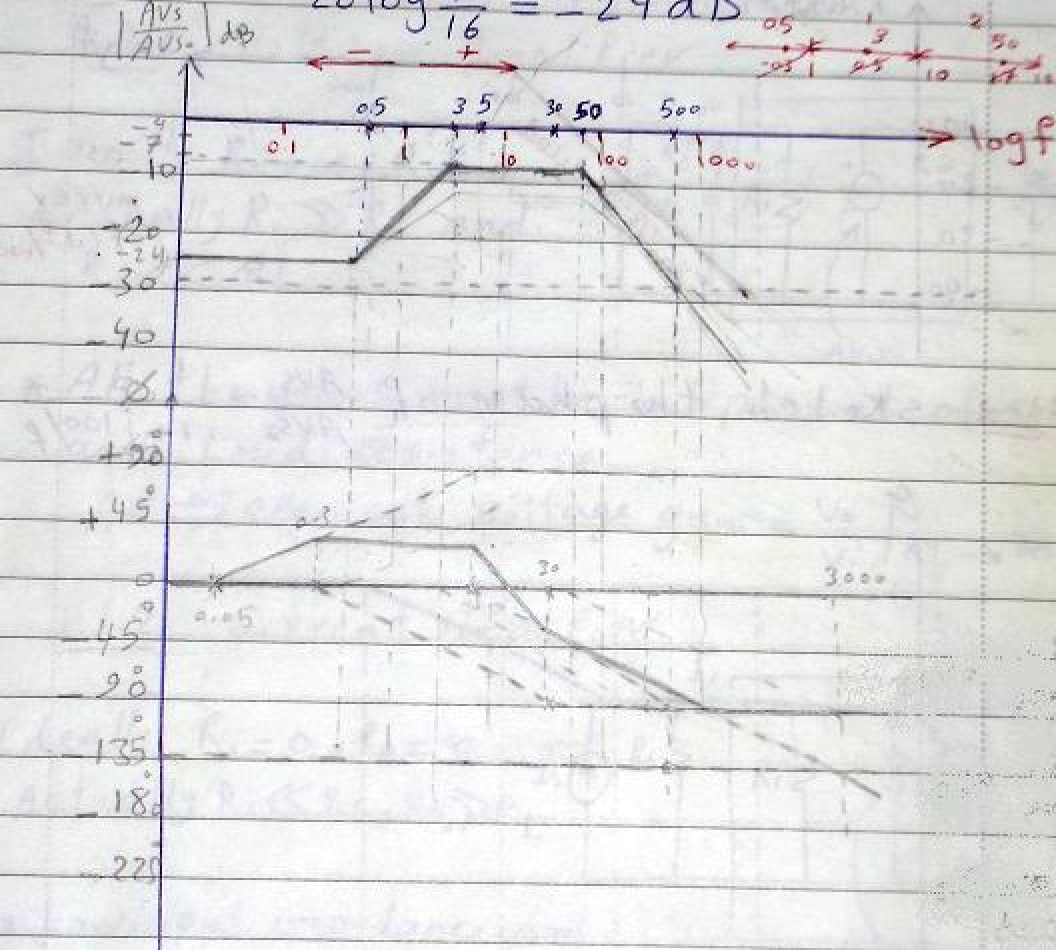
Since $C_e = 100\,PF$, $C_c = 3\,pF$, $r_{b'e} = 1\,K\Omega$, $r_{bb'} = 100\,\Omega$, $g_m = 50\,m\,A/V$, $R_s = 50\,\Omega$, So new C_c of $Q_2 = 3*(1+50*2) = 303\,PF$, and new C_c of $Q_1 = 109\,PF$, & the cct. will be:



Ex. Sketch Magnitude & phase for

$$\frac{A_{VS}}{A_{VS_o}} = \frac{1}{16}\,\frac{(1+jf/0.5)}{(1+jf/3)(1+jf/50)}$$

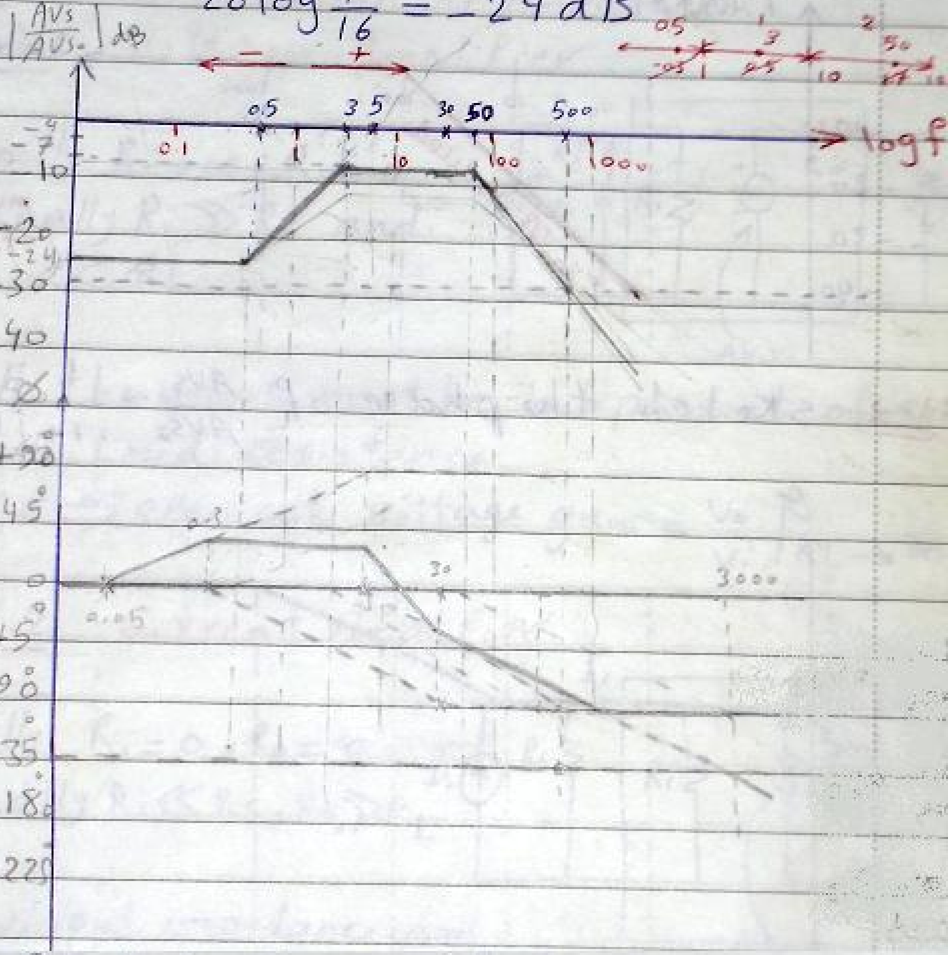
$$20\log\frac{1}{16} = -24\,dB$$



Ex. Sketch Magnitude & phase for

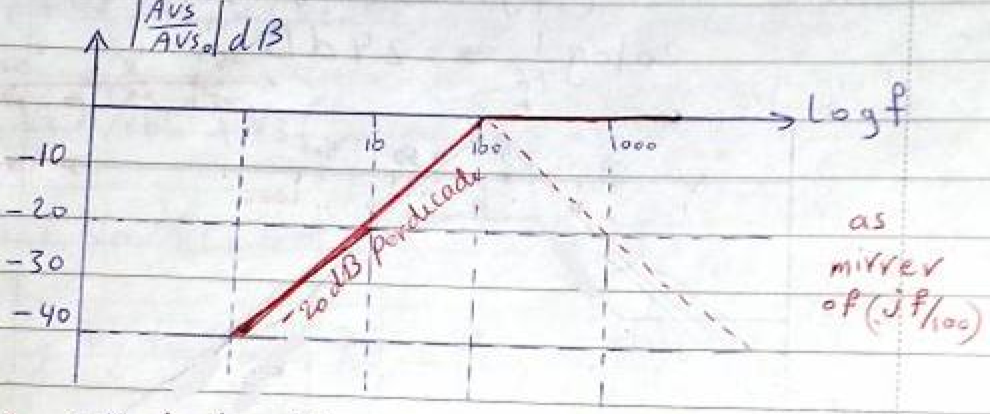
$$\frac{A_{VS}}{A_{VS_0}} = \frac{1}{16}\,\frac{(1+jf/0.5)}{(1+jf/3)(1+jf/50)}$$

$$20\log\frac{1}{16} = -24\,dB$$



Ex. Sketch the Magnitude of:

$$\frac{A_{VS}}{A_{VS_0}} = \frac{1}{1 - j100/f}$$



H.w sketch the phase of $\frac{A_{VS}}{A_{VS_0}} = \frac{1}{1 - j100/f}$

$(V_1 - V_S)(1/(R_S + r_{bb'})) + V_1 * [1/r_{b'e} + 1/X_{Ce} + 1/X_{C_1}] = 0$ --- ①

$g_m V_1 + V_2\, 1/R_{L_1} + (V_2 - V_3)\frac{1}{r_{bb'}} = 0$ ------ ②

$(V_3 - V_2)\, 1/r_{bb'} + V_3 (1/r_{b'e} + 1/X_{Ce} + 1/X_{C_2}) = 0$ --- ③

$g_m V_3 + V_o\, 1/R_{L_2} = 0$ ---------- ④

Solving by taking $R_{L_1} = R_{L_2} = 2K\Omega$

$$A_{VS} = \frac{V_o}{V_S} = \frac{2810}{(1 + jf/5.85*10^5)(1 + jf/5.85*10^6)}$$ H.W

The cct. has two poles, $f_1 = 0.585$ MHZ and $f_2 = 5.85$ MHZ, $f_H = f_1$

H.W. For the cct shown, The transistors are identical and having the following parameters.
$h_{ie} = 1K\Omega$, $h_{fe} = 50$, $h_{re} = h_{oe} = 0$, $C_b = 1\mu F$, $C_Z = 0.3\mu F$

ⓐ Find A_{VS}

ⓑ Estimate $\frac{A_{VS}}{A_{VS_o}}$ the lower 3dB freqy