模电 第4章作业 19041002 自动化1到王 方尧

4.2 $f_L=10Hz$, $f_H=10^5Hz$, $|\dot{A}_{usm}|=10^{\frac{30}{20}}\approx 31.6$

$$\dot{A}_u=\frac{-31.6\,jf/10}{(1+\frac{jf}{10})(1+\frac{jf}{10^5})}=-\frac{3.16jf}{(1+j\frac{f}{10})(1+j\frac{f}{10^5})}$$

4.3 $f_{L1}=1Hz$, $f_{L2}=10Hz$, $f_H=2.5\times10^5Hz$.

$$|\dot{A}_{usm}|=10^{\frac{40}{20}}=100.$$

$$\dot{A}_{us}=\frac{-100\,j\frac{f}{1}\cdot j\frac{f}{10}}{(1+jf)(1+j\frac{f}{10})(1+j\frac{f}{2.5\times10^5})}=\frac{10f^2}{(1+jf)(1+j\frac{f}{10})(1+j\frac{f}{2.5\times10^5})}$$

4.4. 上限频率 $f_H=10^4Hz$, $-60dB/10$倍频.

(1) 由于有上限频率，为直接耦合方式，

(2) 高频段中幅频特性为$-60dB/10$倍频，故为三级放大电路.

(3) $f=10^4Hz$ 时附加相移为 $-3\times45^\circ=-135^\circ$,

$f=10^5Hz$ 时，附加相移 $-3\times90^\circ=-270^\circ$

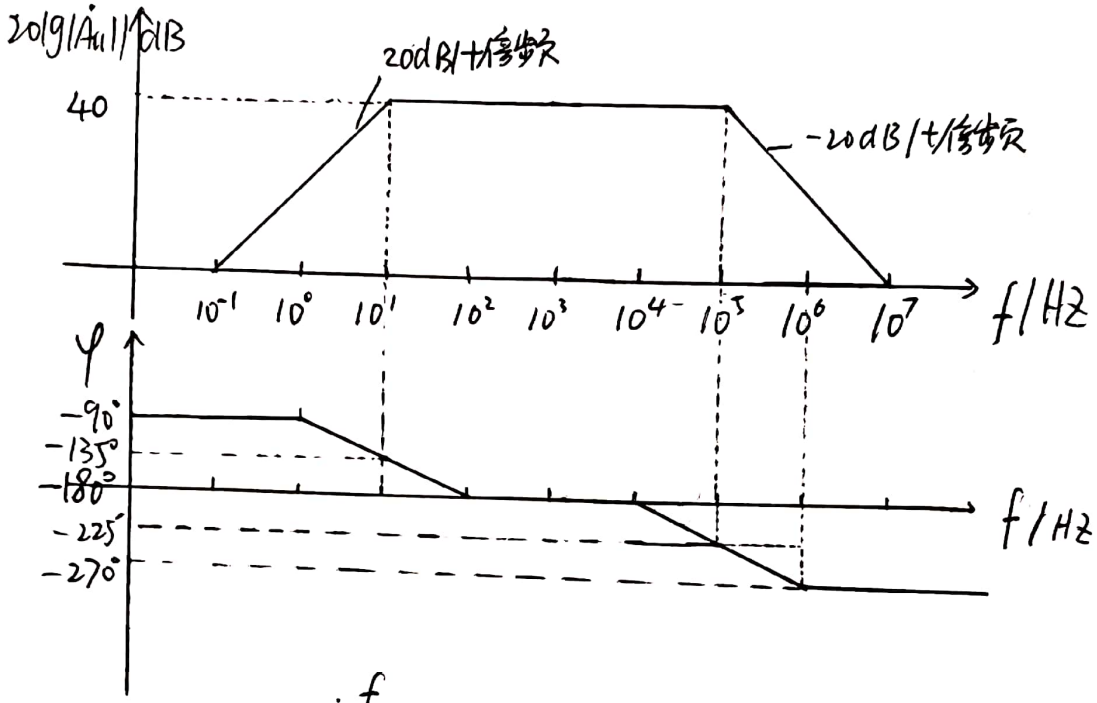
(4). 各级上限频率均为 10^4Hz,

整个电路上限频率为 $\frac{1}{f_H}=1.1\sqrt{\sum_i\frac{1}{f_{Hi}^2}}$ $\Rightarrow f_H=5.25kHz$

4.5 $\dot{A}_u = \dfrac{-100j\frac{f}{10}}{(1+j\frac{f}{10})(1+j\frac{f}{10^5})}$

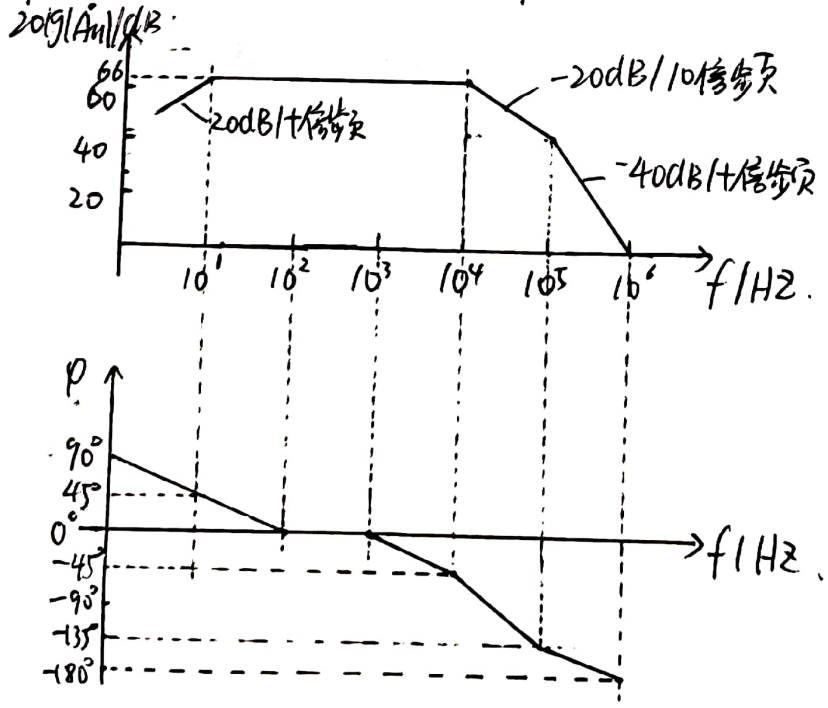
故 $\dot{A}_{um} = -100$，$f_L = 10Hz$，$f_H = 10^5 Hz$.

$20\lg|\dot{A}_{um}| = 40dB$



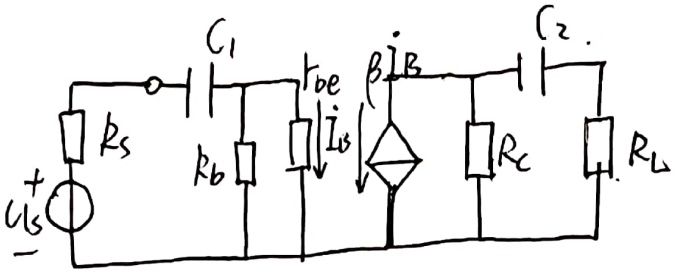
4.6 $\dot{A}_u = \dfrac{2000j\frac{f}{10}}{(1+j\frac{f}{10})(1+j\frac{f}{10^4})(1+j\frac{f}{10^5})}$ 得 $\dot{A}_{um} = 2000$，$f_L = 10Hz$

$f_{H1} = 10^4 Hz$，$f_{H2} = 10^5 Hz$ $\dfrac{1}{f_H} = 1.1\sqrt{\sum_i \dfrac{1}{f_{Hi}^2}}$ $\Rightarrow f_H = 9.04kHz$.



$20\lg|\dot{A}_{um}| = 66dB$

4.8



(1) $R_{c1} = R_s + R_b // r_{be} = 1.998\,k\Omega$.

$R_{c2} = R_c + R_L = 10k\Omega$.

$\tau_{c1} = \tau_{c2} \Rightarrow R_{c1} \cdot C_1 = R_{c2} \cdot C_2 \Rightarrow C_1 : C_2 = R_{c2} : R_{c1} = 5$

(2) 若 C_1 与 C_2 回路时间常数为 25ms，即 $\tau_{c1} = \tau_{c2} = 25ms$

$\Rightarrow C_1 = 12.5\mu F$, $C_2 = 2.5\mu F$.

$f_{L1} = f_{L2} = \frac{1}{2\pi\tau} = 6.37Hz$.

$f_L = 1.1\sqrt{\sum_i f_{Li}^2} = 1.1\sqrt{2} f_{L1} = 9.91Hz$.

4.13. (1) 由于各电容容值相等. $f = \frac{1}{2\pi\tau} = \frac{1}{2\pi RC}$

电路下限频率由各电容最大下限频率决定，即最小等效电阻决定。

知 Ce 所在回路等效电阻最小，故决定电路下限频率的是 Ce.

(2) 因为 $R_2 // R_3 // R_4 > R_1 // R_s$. 故 C_{c2}' 时间常数大于 C_{c1}' 所在回路时间常数. 故第二个极限频率低