模电第六章习题　19040102　方尧　自动化1班

6.2 $U_{O1}=-U_I\cdot\frac{R_f}{R}$　　$U_{O2}=U_I\cdot\frac{R_f+R}{R}$

$=-10U_I$　　$=11U_I$

$\max\{U_O\}=\pm 14V$

U_I/V	0.1	0.5	1.0	1.5
U_{O1}/V	-1	-5	-10	-14
U_{O2}/V	1.1	5.5	11	14

6.4 输入电阻 $R_i=\frac{U_I}{I_I}=R_1=50k\Omega$.

$U_M=-\frac{R_2}{R_1}U_I$　$U_O=U_M-R_3\left(\frac{U_I}{R_1}+\frac{-U_M}{R_4}\right)=-\frac{R_2(R_3+R_4)+R_3R_4}{R_1R_4}U_I=-104U_I$

即比例系数为-104

6.5 (1) R_2短路　$U_O=-2U_I$　故 $U_I=2V$　$U_O=-4V$

(2) R_3短路　$U_O=-2U_I$　故 $U_I=2V$.　$U_O=-4V$.

(3) R_4短路　$U_O=-100U_I$　故 $U_I=2V$. 且 $U_{Omax}=14V$ 故 $U_O=-14V$

(4) R_4断路　$U_O=-4U_I$　故 $U_I=2V$　$U_O=-8V$

6.6 (a) $U_P=U_N=U_{I3}$

$U_O=U_{I3}-R_f\left(\frac{U_{I1}-U_{I3}}{R_1}+\frac{U_{I2}-U_{I3}}{R_2}\right)$

$=-2U_{I1}-2U_{I2}+5U_{I3}$

(b) $\frac{U_{I2}-U_P}{R_2}=\frac{U_P-U_{I3}}{R_3}\Rightarrow$

$U_N=U_P=\frac{10U_{I2}+U_{I3}}{11}$

$U_O=U_N-R_f\cdot\frac{U_{I1}-U_N}{R_1}=-10U_{I1}+10U_{I2}+U_{I3}$

(c) $U_P=U_N=\frac{R_f}{R_1+R_f}U_{I2}=\frac{8}{9}U_{I2}$.

$U_O=U_N-R_f\cdot\frac{U_{I1}-U_N}{R_1}=8U_{I2}-8U_{I1}$

(d) $\frac{U_{I3}-U_P}{R_3}=\frac{U_P-U_{I4}}{R_4}\Rightarrow U_P=U_N=\frac{40U_{I3}+U_{I4}}{41}$

$U_O=U_N-R_f\left(\frac{U_{I1}-U_N}{R_1}+\frac{U_{I2}-U_N}{R_2}\right)$.

$=40U_{I3}+U_{I4}-20U_{I1}-20U_{I2}$

6.9 (1) $U_{N1}=U_{P1}=\frac{Rf}{R+Rf}U_{I2}=\frac{10}{11}U_{I2}$.

$U_o=\frac{R_W}{R_1}\left(U_{N1}-R_f\cdot\frac{U_{I1}-U_{N1}}{R}\right)=\frac{10R_W}{R_1}(U_{I2}-U_{I1})$

(2) 即 $R_W/R_1=1$, $U_o=10(U_{I2}-U_{I1})=100mV$

(3) $\max\{U_{I2}-U_{I1}\}=U_{I2max}-U_{I1min}=20mV$

$U_o=\frac{10R_W}{R_1}\cdot\max\{U_{I2}-U_{I1}\}\le 14V$ 得 $\frac{R_W}{R_1}=\frac{R_W}{R_W-R_2}\le 70\Rightarrow R_{2max}\approx 9.857k\Omega$

6.10 (a) 设 R_5 上端为 U_M

$U_M=-R_3\left(\frac{U_{I1}}{R_1}+\frac{U_{I2}}{R_2}\right)$. $U_o=U_M-\left(-\frac{U_M}{R_3}-\frac{U_M}{R_5}\right)R_4=-\left(R_3+R_4+\frac{R_3R_4}{R_5}\right)\left(\frac{U_{I1}}{R_1}+\frac{U_{I2}}{R_2}\right)$

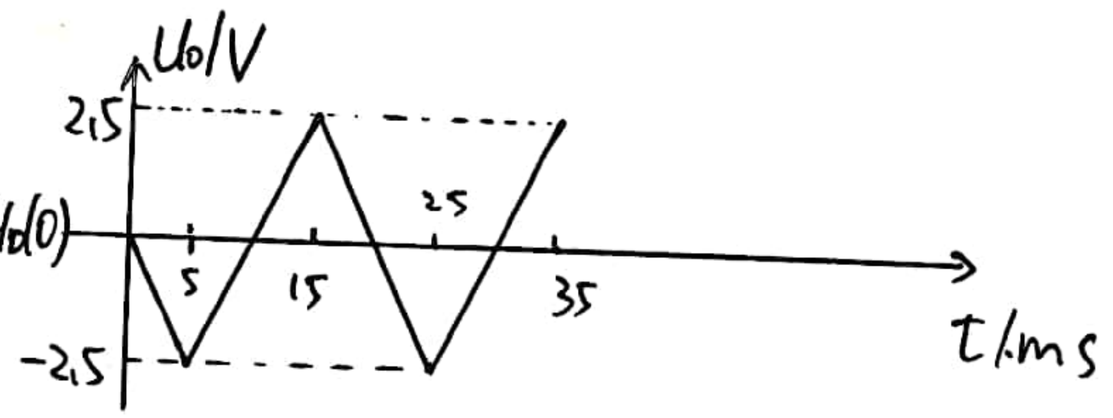
(b) $U_{o1}=\left(1+\frac{R_3}{R_1}\right)U_{N1}$ $U_o=U_{o1}-\frac{U_{o1}-U_{N2}}{R_4}(R_4+R_5)=-\left(1+\frac{R_5}{R_4}\right)(U_{N1}-U_{N2})=-\left(1+\frac{R_5}{R_4}\right)U_I$

(C) $\frac{U_{I1}+U_{I2}+U_{I3}-3U_N}{R_1}R_2=U_N$

$U_o=\frac{R_3+R_4}{R_3}U_N=10(U_{I1}+U_{I2}+U_{I3})$

6.11 $U_o=\frac{1}{C}\int_0^t-\frac{U_I}{R}dt=-100\int_0^t U_I dt+U_o(0)$

如右图所示.



6.14 (1) $U_{N1}=U_{P1}=\frac{R'}{R_2+R'}U_o$, $U_{o1}=U_{N1}-\frac{U_I-U_{N1}}{R_1}R_f=U_o-U_I$

$U_C=U_o$ $i_C=\frac{U_{o1}-U_C}{R}$ $i_C=C\frac{dU_C}{dt}$ 即 $U_I=-\frac{1}{10}\cdot\frac{dU_o}{dt}$ 即 $U_o=-10\int_0^t U_I dt$

(2) $U_o(t)=-10\int_0^t U_I dt+U_o(0)=-10\times(-1)\cdot t=6V\Rightarrow t=0.6S$

6.16 (1) $U_B = U_{I1} = 4V$, $U_C = U_{I2} = 1V$

$\therefore U_A = U_B + (U_B - U_C) = 7V$, $U_D = U_C - (U_B - U_C) = -2V$

$U_O = \frac{U_D}{R} \cdot 2R = 2U_D = -4V$

即 $U_A = 7V$, $U_B = 4V$, $U_C = 1V$, $U_D = -2V$, $U_O = -4V$

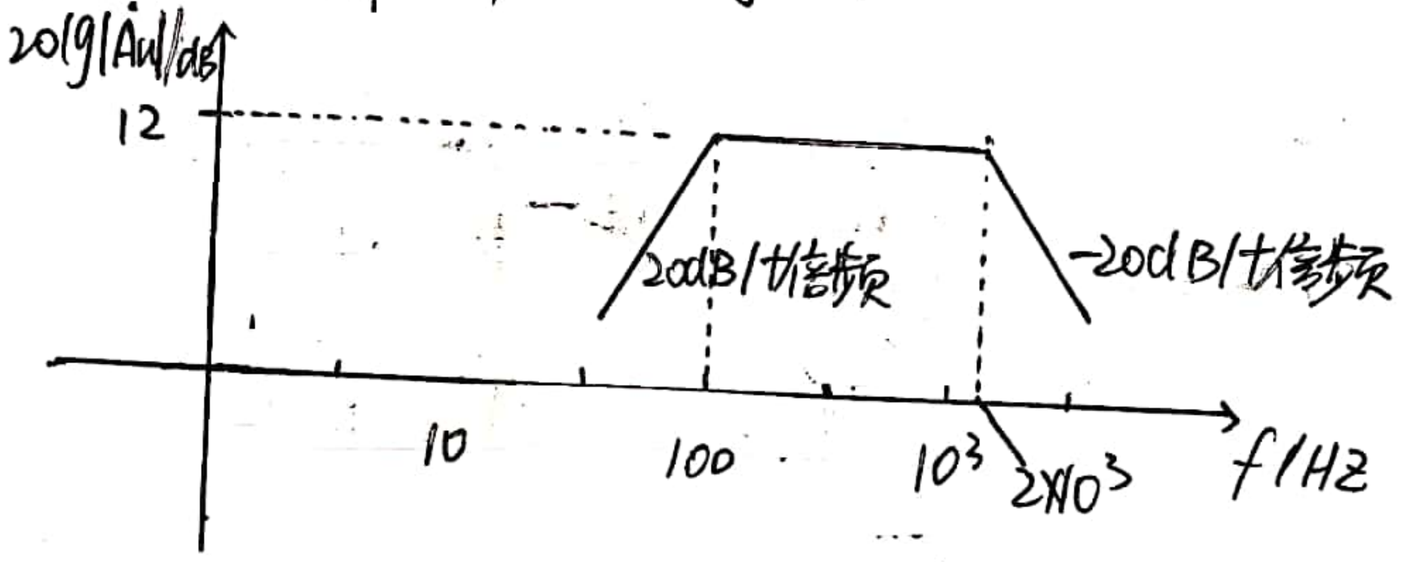
(2) 由于 $I_C = -\frac{U_A - 0}{R_1} = -0.14mA$ 保持不变.

$U_O = U_C + 2(U_D - U_C) = 0$ 得 $U_C = -4V$

又有 $u_C(t) = \frac{1}{C}\int_0^t I_C dt + u_C(0) = \frac{I_C t}{C} = -4$ 得 $t = 28.57mS$

6.21 将两者串联，即构成带通滤波器 $f_L = 100HZ$, $f_H = 2kHZ$

放大倍数 $\dot{A}_{up} = 4$ $20\lg|A_{up}| \approx 12$



6.22 $|\dot{A}_{up}| = 2$ $Q = |\frac{1}{3 - \dot{A}_{up}}| = 1$ $|\dot{A}_u|_{f=f_p} = 2$.

$f_0 = f_p = \frac{1}{2\pi RC} \Rightarrow R = 160k\Omega$.

$R_1 // R_2 = 2R \Rightarrow R_1 = R_2 = 4R = 640k\Omega$