北京理工大学 BEIJING INSTITUTE OF TECHNOLOGY

作业纸

课程名称：模拟电子技术基础

班级：~~电信1910~~ 教学班级：自动化1908 姓名：陶道奇 学号：1120193420 第 1 页

2-1. 1. a b a a 2. b 3. a b 4. a a b 5. b.

2-4. A：$U_x > U_y > U_z$ $U_{xz} = -0.3\,V$. PNP 型

B：$U_y > U_x > U_z$ $U_{xz} = 0.3\,V$. NPN 型.

2-7. a) 电源 $+V_{cc}$ 改为 $-V_{cc}$.

b) R_b 电阻 ~~不接~~ 应接在电源 $+V_{cc}$ 与基极 b 之间.

c) 基极 b 与电源 $+V_{cc}$ 间加入电阻.

d) 同 b).

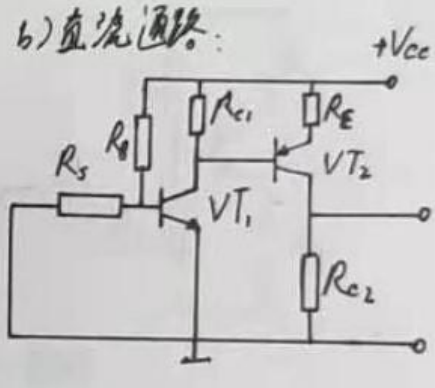
e) 正常放大.

f) 正常放大.

g) 集电极应加入电阻.

h). 去掉 电容 C_b.

b) 直流通路：

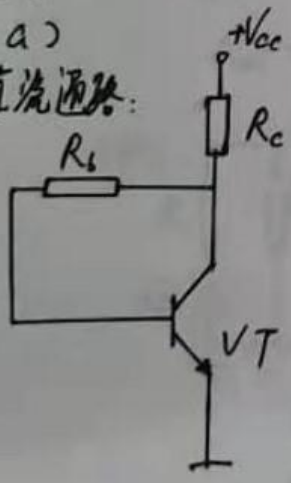


交流通路：

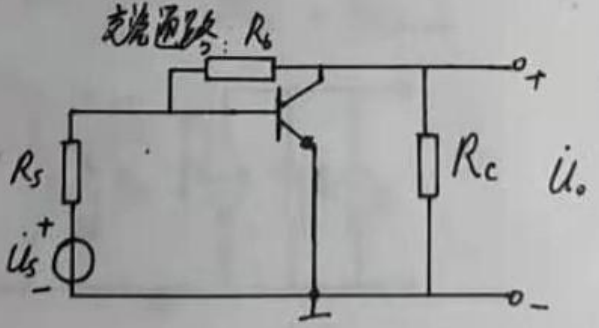
2-8.

a)

直流通路：



交流通路：



联系方式：

2-14. 1. $I_{BQ}=\frac{I_{CQ}}{\beta}=10\mu A$. $R_b=\frac{V_{CC}-U_{BEQ}}{I_{BQ}}=1.13M\Omega$.

2. $A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{-\beta R_L'}{r_{be}}=\frac{-\beta R_L'}{r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}}=-112$

$R_i=\frac{\dot{U}_i}{\dot{I}_i}=\frac{R_B\times r_{be}}{R_B+r_{be}}=2.7k\Omega$.

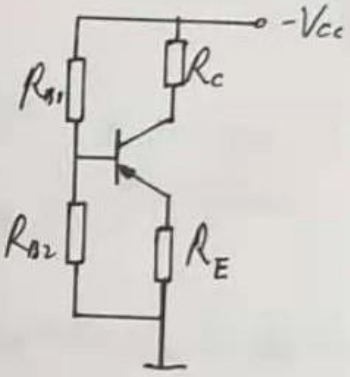
$A_{us}=\frac{\dot{U}_o}{\dot{U}_s}=\frac{R_i}{R_i+R_s}\cdot A_u=-83$.

3. $R_i=2.7k\Omega$. $R_o=R_c=16k\Omega$.

2-15. (1) $U_B=\frac{R_{B2}}{R_{B2}+R_{B1}}\cdot(-V_{CC}-0)=-4V$.

$I_{CQ}=\frac{U_B+0.3}{R_E}=-1.85mA$. $I_{BQ}=\frac{I_{CQ}}{\beta}=-31mA$.

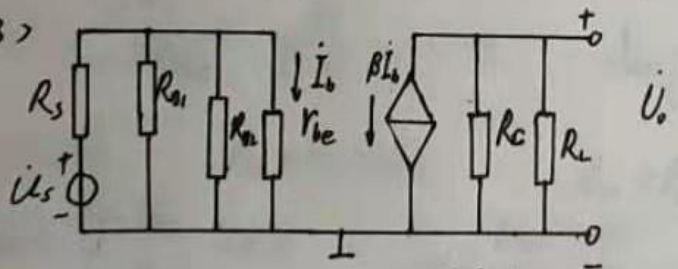
$U_{CEQ}=-V_{CC}+I_{CQ}(R_C+R_E)=-6.75V$.



(2) $I_{CQ}=\frac{V_{CC}+U_{CEQ}}{R_C+R_E}=-2.9mA$. $U_B\approx I_{CQ}\cdot R_E=-4.8V$.

$R_{B1}=\frac{-V_{CC}-U_B}{U_O}\cdot R_{B2}=47k\Omega$.

(3)



$r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}=1.3k\Omega$.

$R_i=R_{B1}\,//\,R_{B2}\,//\,r_{be}=1.2k\Omega$.

$A_{us}=\frac{\dot{U}_o}{\dot{U}_s}=-\frac{R_i}{R_i+R_s}\cdot\frac{\beta R_c\cdot R_L}{r_{be}(R_c+R_L)}=-55$.

$R_o=R_c=3k\Omega$.

北京理工大学 BEIJING INSTITUTE OF TECHNOLOGY

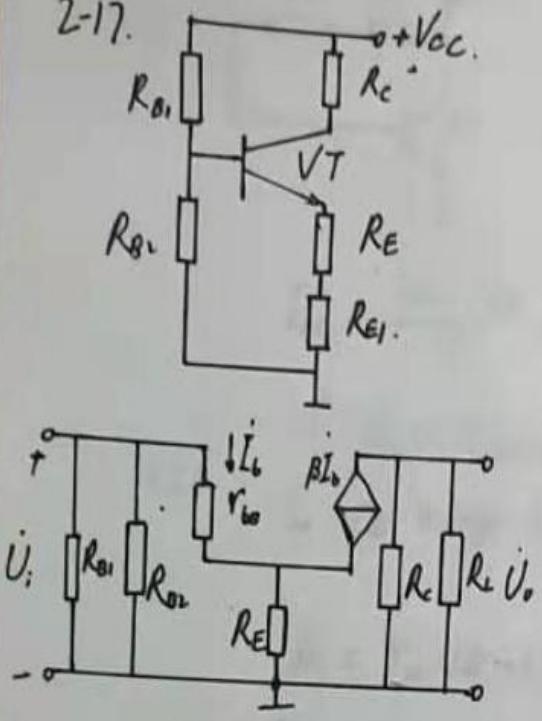
作业纸

课程名称：_____

班级：　　教学班级：　　姓名：　　学号：　　第 3 页

2-16. (1) 电压增益基本不变，输入电阻增大。　(2) 电压增益减小，输入电阻增大。

2-17.



(1) $R_E=0$.　$I_E=\frac{U_B-0.7V}{R_E+R_{E1}}=1.92\,mA$

$r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_E}=1.217k\Omega$

$A_u=\frac{\dot{U}_o}{\dot{U}_i}=-\frac{\beta(R_L/\!/R_C)}{r_{be}+(1+\beta)R_E}=-174$

$R_i=\frac{U_i}{I_i}=R_{B1}/\!/R_{B2}/\!/[r_{be}+(1+\beta)R_E]=1.63k\Omega$.

$R_o=R_C=8.2k\Omega$.

(2) $R_E=200\Omega$.　同理 $A_u=-15.5$.　$R_i=6.3k\Omega$.　$R_o=8.2k\Omega$.

R_E 增大，电压增益减小，输入电阻增大。

2-18. (1) $U_B=\frac{R_{B2}V_{CC}}{R_{B1}+R_{B2}}=4.3V$.　$I_{CQ}=\frac{U_B-0.7V}{R_E}=1.8mA$　$U_{CEQ}=V_{CC}-I_{CQ}(R_C+R_E)=2.8V$.

(2) $r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_E}=1.2k\Omega$.　$R_i=R_{B1}/\!/R_{B2}/\!/[r_{be}+(1+\beta)R_E]=8.2k\Omega$

$A_{us1}=\frac{-\beta R_C}{r_{be}+(1+\beta)R_E}\cdot\frac{R_i}{R_i+R_s}=-0.79$.　$A_{us2}=\frac{(1+\beta)R_E}{r_{be}+(1+\beta)R_E}\cdot\frac{R_i}{R_i+R_s}=0.797$.

(3) $R_i=8.2k\Omega$.　$R_{o1}=R_C=2k\Omega$.　$R_{o2}=R_E/\!/\left[\frac{r_{be}+(R_s/\!/R_{B1}/\!/R_{B2})}{1+\beta}\right]=33\Omega$.

2-19. (1) $U_{BQ}=\frac{R_{B2}V_{CC}}{R_{B1}+R_{B2}}\approx 5V$.　$I_{EQ}=\frac{U_{BQ}-0.7V}{R_E}=2.15mA$.　$I_{CQ}=\frac{\beta}{1+\beta}I_{EQ}\approx 2.1\,mA$.

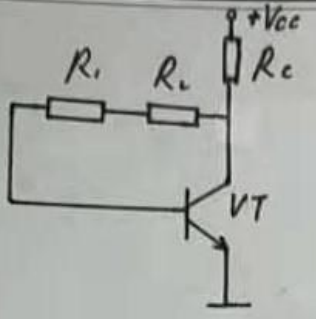
$V_{CEQ}=V_{CC}-I_{EQ}R_E=7.7V$.

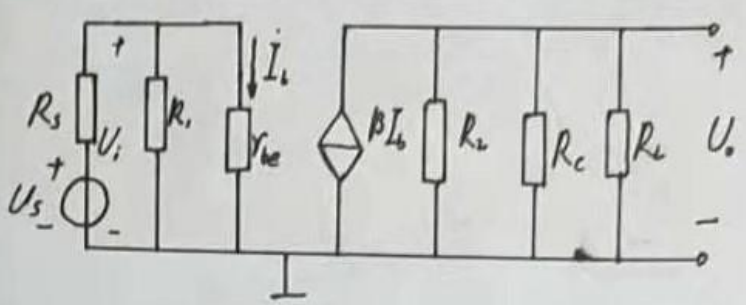
(2) $r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}=1.35k\Omega$.　$A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{(1+\beta)R_L'}{r_{be}+(1+\beta)R_L'}=0.987$.

$R_i=R_{B1}/\!/R_{B2}/\!/[r_{be}+(1+\beta)R_L']=21.8k\Omega$.　$R_o=R_E/\!/\left[\frac{r_{be}+(R_s/\!/R_{B1}/\!/R_{B2})}{1+\beta}\right]=23\Omega$.

联系方式：_____

2-24. (1)





$I_{RC} = \frac{V_{cc} - U_{CEQ}}{R_c} = I_{BQ} + I_{CQ}$　　$\therefore I_{BQ} = \frac{V_{cc} - U_{CEQ}}{(1+\beta)R_c} = \frac{U_{CEQ} - U_{BEQ}}{2R_1}$

$\therefore R_1 = R_2 = 62\,k\Omega$.

(2) $r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}} = 1.3\,k\Omega$.　　$A_u = \frac{-\beta(R_c // R_L // R_2)}{r_{be}} = -149$

$R_i = r_{be} // R_1 = 1.3k\Omega$.　　$R_o = R_c // R_2 = 7.3k\Omega$.　　$A_{us} = \frac{R_i}{R_i + R_s} A_u = -83$.

(3) $R_i = 1.3k\Omega$　　$R_o = 7.3k\Omega$.

2-25. (1) $I_{BQ} = \frac{I_{CQ}}{\beta} = 10\mu A$.

$U_{BQ} = \frac{R_{B1} V_{cc}}{R_{B1} + R_{B2}} = 3.5V$　　$U_{BEQ} = \frac{U_{BQ}}{F} = 0.7V$

$I_{EQ} = \frac{U_{BQ} - U_{BEQ}}{R_E} = 1mA$.　　$\therefore R_E = 2.8k\Omega$.　　$R_c = \frac{V_{cc} - U_{BQ} + U_{BEQ} - U_{CEQ}}{I_{CQ}} = 5.2k\Omega$.

$R_{B1} = \frac{U_{B1}}{I_1} = 35k\Omega$.　　$R_{B2} = \frac{V_{cc}}{I_c} - R_{B1} = 85k\Omega$.

(2) $A_u = -\frac{\beta R_c}{r_{be}} = -193$.

$R_i = R_{B2} // R_{B1} // r_{be} = 2.9k\Omega$.

$R_o = R_c = 5.2k\Omega$.