2-4. A: $U_X > U_Y > U_Z$.

$U_X - U_Y < U_{ON}$, $U_Y - U_Z > U_{ON}$.

∴ X集电极, Y基极, Z发射极. NPN管.

B: $U_Y > U_X > U_Z$.

$U_Y - U_X > U_{ON}$, $U_X - U_Z < U_{ON}$.

∴ Y集电极, X基极, Z发射极. PNP管.

2-7. a) 不能. PNP管 → NPN管

b) 不能. $U_{be} < U_{ON}$. $R_B$ 上接 $V_{cc}$ 下接 b.

c) 不能. $U_{ce} = U_{be}$. 去掉 b 上接 $V_{cc}$ 的线

d) 不能. $U_{be} < U_{ON}$. $R_B$ 接 $V_{cc}$ 与 b.

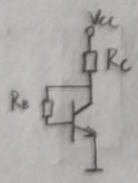
e) 能.

f) 能.

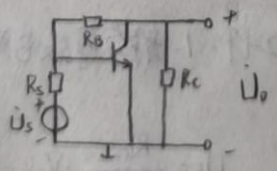
g) 不能. $C_2$ 与 $V_{cc}$ 相接. 在 $C_2$ 与 $V_{cc}$ 间加 $R_c$.

h) 不能. $C_1 C_B$ 与 $V_{cc}$ 相连, 去掉 $C_B$.

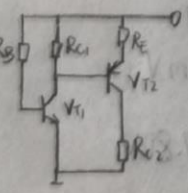
2-8. a) 直:



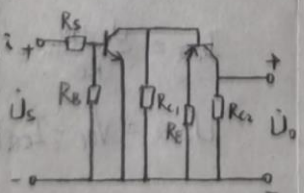

交:




b) 直:




交:



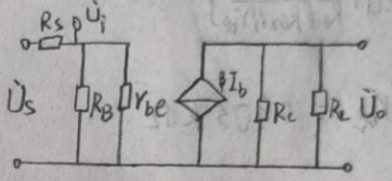

2-14. 解: 1. $I_{CQ} = 0.5mA$. $I_{BQ} = \frac{I_{CQ}}{\beta} = 10\mu A$.

$I_{EQ} = (\beta+1) I_{BQ} = 0.51 mA$.

$r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}} = 2700\Omega$.

$I_{BQ}(R_B + r_{be}) = V_{cc}$ 解得 $R_B = 1.1973 M\Omega$.

2. 微变等效电路:



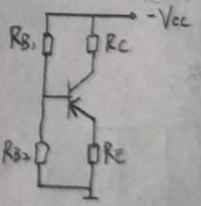

$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{-\dot{I}_c(R_L // R_c)}{\dot{I}_b r_{be}} = -113.96$

$A_{us} = \frac{\dot{U}_o}{\dot{U}_s} = \frac{R_B // r_{be}}{R_s + R_B // r_{be}} A_u = -83.11$.

3. $R_i = \frac{\dot{U}_i}{\dot{I}_i} = R_B // r_{be} = 2.69 k\Omega$.

$R_o = \frac{\dot{U}_o}{\dot{I}_o} = R_c = 16k\Omega$.

2-15. 1. 直流等效电路:




$U_B = \frac{R_{B2}}{R_{B1}+R_{B2}} V_{cc} = -4V$.

$I_{EQ} = \frac{U_B - U_{BE}}{R_E} = 1.65 mA$.

$I_{CQ} \approx I_{EQ} = 1.65mA$.

$I_{BQ} = \frac{I_{EQ}}{\beta} = 275\mu A$.

$U_{CEQ} = V_{cc} - I_{CQ} R_c + I_{EQ} R_E = -7.75V$.

∴ $I_{BQ} = 27.5\mu A$, $I_{CQ} = 1.65 mA$, $U_{CEQ} = -7.75V$.

联系方式：

2. $-I_{EQ}(R_C+R_E)+U_{CEQ}=V_{CC}$.

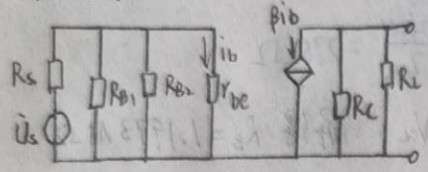
解得 $I_{EQ}=2.4mA$.

$U_E=-R_E I_{EQ}=-4.8V$.

$U_B=U_E+U_{BE}=-5.5V$.

$\frac{R_{B2}}{R_{B1}+R_{B2}}V_{CC}=U_B$, 解得 $R_{B1}=38.18k\Omega$.

3. 微变等效电路: $r_{be}=(1+\beta)\frac{26}{I_{EQ}}=961\Omega$.

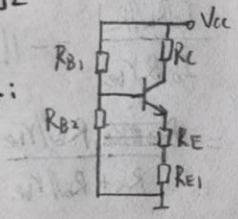



$A_{US}=\frac{\dot{U}_{o0}}{\dot{U}_S}=\frac{\beta i_b(R_C/\!/R_L)}{i_b r_{be}(1+\frac{R_S}{R_{B1}/\!/R_{B2}/\!/r_{be}})}=59.26$.

$R_i=R_{B1}/\!/R_{B2}/\!/r_{be}=0.903k\Omega$.

$R_o=R_C=3k\Omega$.

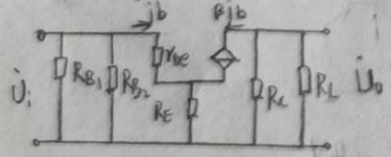
2-17. 直流等效电路:




$U_B=\frac{R_{B2}}{R_{B1}+R_{B2}}V_{CC}=2.12V$.

$I_{EQ}=\frac{U_B-U_{BE}}{R_E+R_{E1}}$. $r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}$.

微变等效电路:




$A_u=\frac{\dot{U}_o}{\dot{U}_{oi}}=\frac{\beta i_b(R_C/\!/R_L)}{i_b(r_{be}+(1+\beta)R_E}$.

$R_i=R_{B1}/\!/R_{B2}/\![r_{be}+(1+\beta)R_E]$.

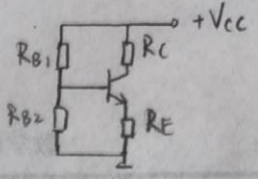
$R_o=R_C$.

$R_E=0$, $A_u=181.1$. $R_i=1.60k\Omega$. $R_o=8.2k\Omega$.

$R_E=240\Omega$, $A_u=15.68$. $R_i=22.63k\Omega$, $R_o=8.2k\Omega$.

∴ $R_E$ 在电路中可"显著增加电路的输入电阻, 提高电路的抗干扰能力, 但会造成电压增益 $A_u$ 降低.

2-18. 1. 直流等效电路:



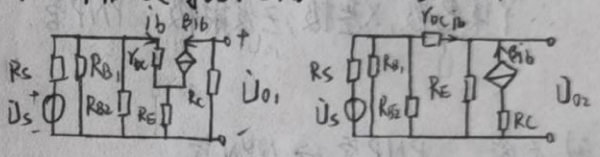

$U_B=\frac{R_{B2}}{R_{B1}+R_{B2}}V_{CC}=4.29V$.

$I_{EQ}=\frac{U_B-U_{BE}}{R_E}\approx I_{CQ}=1.79mA$.

$V_{CC}=U_{CEQ}+I_{CQ}/\!/R_C+I_{EQ}R_E$.

∴ $I_{CQ}=1.79mA$, $U_{CEQ}=2.83V$.

2. $\dot{U}_{o1}$ 微变等效电路: $\dot{U}_{o2}$ 微变等效电路:




$A_{u1}=\frac{\dot{U}_{o1}}{\dot{U}_S}=\frac{\beta i_b R_C}{i_b(r_{bc}+(\beta+1)R_E)+I_S R_S}=0.78$.

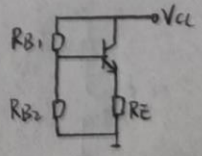
$A_{u2}=\frac{\dot{U}_{o2}}{\dot{U}_S}=\frac{(\beta+1)i_b R_E}{i_b(r_{bc}+(1+\beta)R_E)+I_S R_S}=0.79$.

3. $R_i=R_{B1}/\!/R_{B2}/\![r_{bc}+(1+\beta)R_E]=8.01k\Omega$.

$R_{o1}=R_C=2k\Omega$

$R_{o2}=\frac{\dot{U}_t}{\dot{I}_o}=\frac{\dot{U}_o}{\dot{I}_{RE}-(\beta+1)\dot{I}_b}=\frac{\dot{U}_o}{\frac{\dot{U}_o}{R_E}-(\beta+1)\frac{-\dot{U}_o}{r_{be}+R_S/\!/R_{B1}/\!/R_{B2}}}=28.76\Omega$

2-19. 1. 静态等效电路:




$U_B=\frac{R_{B2}}{R_{B1}+R_{B2}}V_{CC}=4.90V$.

$I_{CQ}=\frac{U_B-U_{BE}}{R_E}=2.10mV$.

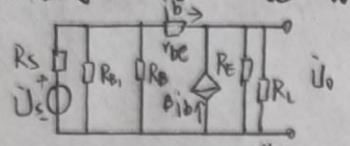
$U_{CEQ}=V_{CC}-I_{CQ}R_E=7.80V$.

# 作 业 纸

课程名称：模电

班级：　　教学班级：0601907　　姓名：李俊瑞　　学号：1120193120　　第　　页

2. 微变等效电路：$r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}=1350\Omega$.

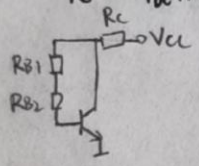



$$A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{(1+\beta)\dot{I}_b(R_E/\!/R_L)}{\dot{I}_b r_{be}+(1+\beta)\dot{I}_b(R_E/\!/R_L)}=0.987.$$

$$R_i=R_{B1}/\!/R_{B2}/\!/[r_{be}+(1+\beta)(R_E/\!/R_L)]=21.86k\Omega.$$

$$R_o=\frac{\dot{U}_o}{\dot{I}_o}=\frac{\dot{U}_o}{\dot{I}_{RE}-(\beta+1)\dot{I}_b}=\frac{\dot{U}_o}{\frac{\dot{U}_o}{R_E}-(\beta+1)\frac{\dot{U}_o}{r_{be}+R_s/\!/R_{B1}/\!/R_{B2}}}=18.15\Omega.$$

2-24. 1. 直流等效电路



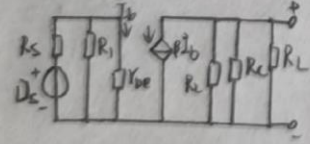

$$I_{RC}=\frac{V_{CC}-V_{CEQ}}{R_C}=1.34mA.$$

$I_{RC}=I_B+I_C=(\beta+1)I_B$，　$I_B=26.3\mu A$，$I_C=1.32mA$

$$R_1+R_2=\frac{U_{CEQ}-U_{BEQ}}{I_B}=125.46k\Omega$$

$\therefore R_1=R_2=62.73k\Omega$.

2. 微变等效电路：$r_{be}=r_{bb}+(1+\beta)\frac{26}{I_{EQ}}=1290\Omega$




$$A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{\beta\dot{I}_b(R_2/\!/R_C/\!/R_L)}{\dot{I}_b r_{be}}=149.17.$$

$$A_{us}=\frac{\dot{U}_o}{\dot{U}_i+\frac{\dot{U}_i}{R_1/\!/r_{be}}R_s}=83.28.$$

3. $R_i=R_1/\!/r_{be}=1.26k\Omega$.

$R_o=R_C/\!/R_2=7.25k\Omega$.

2-25. 1. $I_{CQ}=1mA$，$\approx I_{EQ}$.　$U_C=V_{CC}-I_{CQ}R_C$.　$U_E=I_{EQ}R_E$.

$$I_{BQ}=\frac{I_{CQ}}{\beta}=1\mu A.\qquad I_1=10I_{BQ}=0.01mA.$$

$$U_{CEQ}=U_C-U_E=V_{CC}-I_{CQ}(R_C+R_E)$$

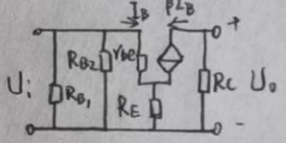
$$V_{CC}=I_1R_{B1}+(I_1-I_{BQ})R_{B2}.$$

$$U_{BEQ}=I_1R_{B1}-I_{EQ}R_E.$$

$$5U_{BEQ}=I_1R_{B1}.$$

联立上述4式，解得 $\begin{cases}R_{B1}=350k\Omega\\R_{B2}=944k\Omega\\R_C=5.2k\Omega\\R_E=2.8k\Omega\end{cases}$.

2、微变等效电路：




$$A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{\beta\dot{I}_b R_C}{r_{be}\dot{I}_b+(1+\beta)R_E\dot{I}_b}=1.82.$$

$$R_i=R_{B1}/\!/R_{B2}/\!/[r_{be}+(1+\beta)R_E]=134.79k\Omega.$$

$$R_o=R_C=5.2k\Omega.$$

联系方式：