2-1 (1) a、b、a、a.

(2) b.

(3) a、b

(4) a、a、b

(5) b.

2-4 A: $U_x > U_y > U_z$ $U_{yx} = -0.3V$

$\therefore U_e > U_b > U_c$ 为PNP型

B: $U_y > U_x > U_z$ $U_{xz} = 0.3V$

$U_c > U_b > U_e$ 为NPN型

2-7 (a) 不能放大，应将 $+V_{CC}$ 改为 $-V_{CC}$，耦合电容极性反接，使 $U_e > U_b > U_c$

(b) 发射结为零偏置，将 R_B 接至电源

(c) 在基极与电源 V_{CC} 之间加 R_B

(d) 晶体管无基极偏置电流，将 R_B 断开，接至 V_{CC}

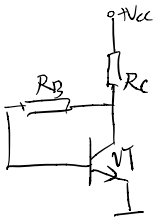
(e) 可以正常放大

(f) 可以正常放大

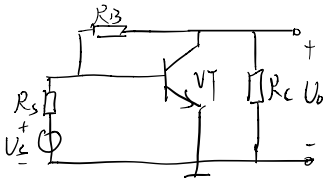
(g) 输出电压对地短路，始终为0，应在集电极加电阻 R_c

(h) 电容 C_B 将晶体管基极对地短路，输入信号无法输入，去掉电容 C_B

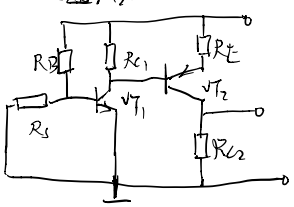
2-8 a 直流通路



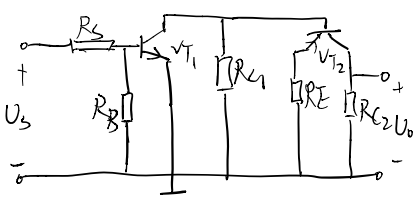
a、交流通路



b 直流通路



b 交流通路



2-14 (1) $I_{BQ}=\frac{I_{CQ}}{\beta}=10\mu A$, $R_B=\frac{V_{CC}-V_{BEQ}}{I_{BQ}}=1.13M\Omega$

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

$A_U=\frac{\dot{U}_o}{\dot{U}_i}=\frac{-\beta R_L'}{r_{be}}=-112$

(3) $R_i=\frac{\dot{U}_i}{\dot{I}_i}=R_B//r_{be}=2.7k\Omega$

$R_o=R_C=16k\Omega$

$A_{US}=\frac{\dot{U}_o}{\dot{U}_S}=\frac{R_i}{R_i+R_S}A_U=-83$

2-15. (1) $U_B=\frac{R_{B2}}{R_{B1}+R_{B2}}(-V_{CC})=\frac{20k\Omega}{60k\Omega+20k\Omega}\times(-16V)=-4V$

$I_{CQ}=\frac{U_B+0.3}{R_E}=1.85mA$

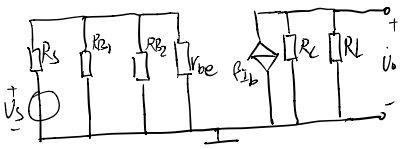
$U_{CEQ}=-V_{CC}+I_{CQ}(R_C+R_E)=-6.75V$

(2) 令 $U_{CEQ}=-4V$, $I_{CQ}=\frac{-V_{CC}-U_{CEQ}}{R_C+R_E}=-2.4mA$

$U_B\approx I_{CQ}R_E=-2.4mA\times2k\Omega=-4.8V$

$U_B=\frac{R_{B2}}{R_{B1}+R_{B2}}(-V_{CC})=-4.8V$, $R_{B2}=47k\Omega$

(3)



$r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}\approx1.3k\Omega$

$R_i=R_{B1}//R_{B2}//r_{be}\approx1.2k\Omega$

$A_{US}=\frac{\dot{U}_o}{\dot{U}_S}=-\frac{R_i}{R_i+R_S}\frac{\beta(R_C//R_L)}{r_{be}}=-55$

$R_o=R_C=3k\Omega$

2-16. 1. 都增大，射极电流 I_E 几乎不变，$A_U=-\frac{\beta R_C//R_L}{r_{be}}\approx-\frac{(R_C//R_L)}{26mV}I_{EQ}$ 不变

$R_i=R_{B1}//R_{B2}//r_{be}$ 增大

2. 若 R_E 增大，射极电流 I_E 减小，A_U 减小，R_i 增大

2-17. (1) $R_E=0$ 时 $I_E=\frac{U_B-0.7V}{R_E+R_{E1}}=1.42mA$

$r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_E}=1.211k\Omega$

$R_i=\frac{\dot{U}_i}{\dot{I}_i}=R_{B1}//R_{B2}//[r_{be}+(1+\beta)R_E]=1.63k\Omega$

$A_U=\frac{\dot{U}_o}{\dot{U}_i}=-\frac{\beta(R_L//R_C)}{r_{be}+(1+\beta)R_E}=-1.74$

(2) $R_E=2000\Omega$时 $I_E=1.18mA$

$$r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_E}=1.4k\Omega$$

$$A_u=\frac{\dot{U}_o}{\dot{U}_i}=R_{B1}//R_{B2}//[r_{be}+(1+\beta)R_E]=6.3k\Omega$$

$$R_o=R_C=8.2k\Omega$$

当R_E增大，$|A_u|$减小，R_i增大

2-18 (1) $U_B=\frac{R_{B2}V_{CC}}{R_{B1}+R_{B2}}=\frac{15000\times10}{15000+20000}=4.3V$

$$I_{EQ}=\frac{U_B-0.7V}{R_E}=\frac{4.3-0.7}{2000}=1.8mA=I_{CQ}$$

$$U_{CEQ}=V_{CC}-I_{CQ}(R_C+R_E)=2.8V$$

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

$$I_{CQ}=\frac{\beta}{1+\beta}I_{EQ}=2.1mA \quad U_{CEQ}=V_{CC}-I_{EQ}R_E=7.7V$$

(2) $r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}=1.35k\Omega$

$$A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{\dot{I}_e R_L'}{\dot{I}_b r_{be}+\dot{I}_e R_L'}=\frac{(1+\beta)R_L'}{r_{be}+(1+\beta)R_L'}=0.987$$

$$R_i=R_{B1}//R_{B2}//[r_{be}+(1+\beta)R_L']=21.8k\Omega$$

$$R_o=R_E//\frac{r_{be}+R_C//R_{B1}//R_{B2}}{1+\beta}=23\Omega$$

2-24 (1) $I_{CQ}=\beta I_{BQ}$ $I_{RC}=I_{BQ}+I_{CQ}$

$$\frac{V_{CC}-U_{CEQ}}{R_C}=I_{BQ}+\beta I_{BQ} \quad I_{BQ}=\frac{U_{CEQ}-U_{BEQ}}{2R_1}$$

$R_1=R_2=62k\Omega$

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

$$A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{-\beta(R_C//R_L//R_2)}{r_{be}}=-149$$

(3) $R_i=r_{be}//R_1=1.3k\Omega$ $R_o=R_C//R_2=7.3k\Omega$

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

2-25、(1) $U_{BQ}=\frac{R_{B1}V_{CC}}{R_{B1}+R_{B2}}=3.5V=5U_{BEQ}$ $I_{EQ}=\frac{U_{BQ}-U_{BEQ}}{R_E}=1mA$

$R_E=2.8k\Omega$ $R_C=\frac{V_{CC}-(U_{BQ}-U_{BEQ})-U_{CEQ}}{I_{CQ}}=5.2k\Omega$

$I_C(R_{B1}+R_{B2})=V_{CC}$ $R_{B1}=37k\Omega$ $R_{B2}=85k\Omega$

(2) $A_u=\frac{-\beta R_C}{r_{be}}=-193$ $R_i=R_{B2}//R_{B1}//r_{be}=2.41k\Omega$

$R_o=R_C=5.2k\Omega$