2-1:

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

2-4:

A管: $U_x > U_y > U_z$ 且 $U_{xy}=0.3V$

∴ y为基极b, x为发射极e, z为集电极c

又∵ $U_e > U_b > U_c$ ∴为PNP型

B管: $U_y > U_x > U_z$ $U_{xz}=0.3V$

∴ x为基极b, z为发射极e, y为集电极c

又∵ $U_c > U_b > U_e$ ∴为NPN型

2-7:

(a)不能放大, $+V_{cc}$应为$-V_{cc}$, 电容极性应反接

(b)不能放大, 晶体管发射结为零偏置, 无法工作在放大状态, R_B应接至V_{cc}

(c)晶体管b极电位为V_{cc}, 管子处于饱和状态, 且动态时基极接地, 无输出入, 不能放大

电路不能放大, 改为基极与V_{cc}之间加R_B

(d)不能放大, 无基极偏置电流, 无法工作在放大状态, 将R_B改接至V_{cc}

(e)可以正常放大

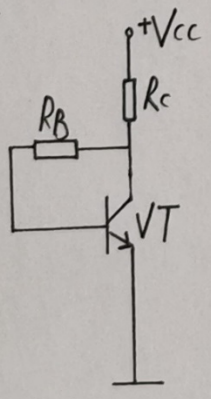
(f)可以正常放大

(g)不能放大, 交流信号输出短路, 集电极加R_c

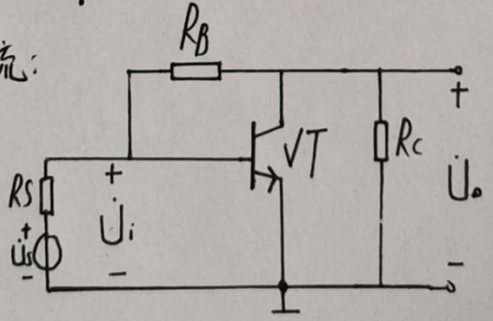
(h)不能放大, 输入信号输入短路, 去掉C_B

2-8:

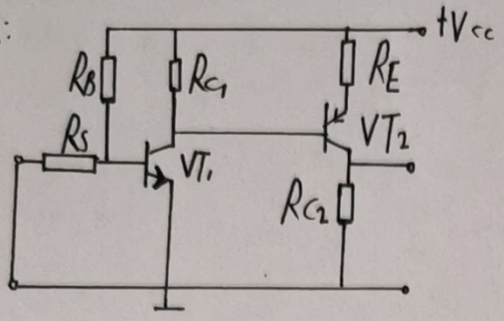
(a)直流:



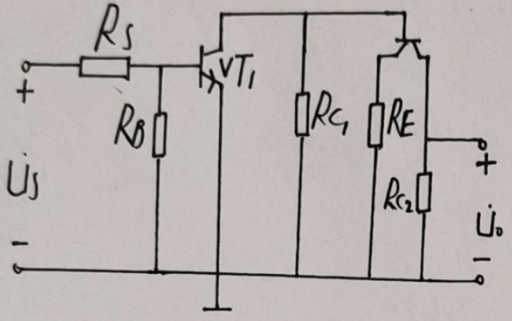
交流:



(b) 直流：



交流：

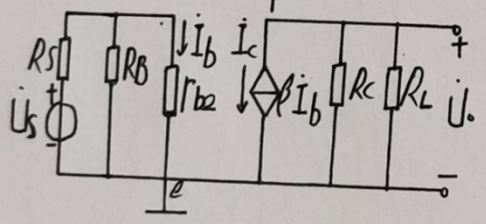


2-14：1.

$$I_{BQ}=\frac{I_{CQ}}{\beta}=10\mu A$$

$$\therefore R_B=\frac{V_{CC}-U_{BEQ}}{I_{BQ}}=1.13M\Omega$$

2)微变等效电路如下：



$$\therefore r_{be}=r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}=100\Omega+\frac{26}{(1+\beta)10}\times(1+\beta)\times10^3\Omega=2.7k\Omega$$

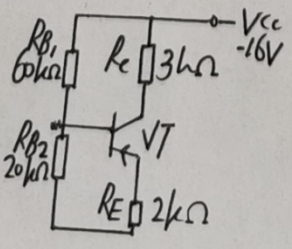
$$\therefore A_u=\frac{\dot{U}_o}{\dot{U}_i}=\frac{-\beta R_L'}{r_{be}}=-112$$

$$R_i=\frac{\dot{U}_i}{I_i}=R_B/\!/r_{be}=2.7k\Omega$$

$$R_o=R_c=16k\Omega$$

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

2-15：1. 直流通路如图：



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

$$I_{CQ} = \frac{U_B+0.3}{R_E} = \frac{-4+0.3V}{2k\Omega} = -1.85mA \qquad I_{BQ} = \frac{1.85mA}{\beta} \approx 30.83\mu A$$

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

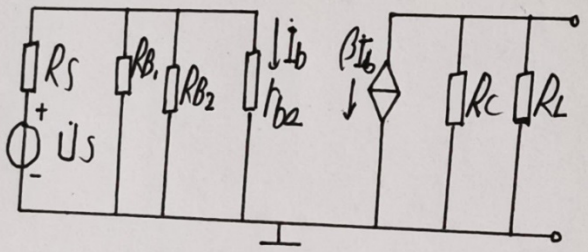
2. $$I_{CQ} = \frac{-V_{CC}-U_{CEQ}}{R_C+R_E} = -2.4mA$$

$$U_B \approx I_{CQ}R_E = -2.4mA\times 2k\Omega = -4.8V$$

$$\because U_B = \frac{R_{B2}}{R_{B1}+R_{B2}}(-V_{CC}) = -4.8V$$

$$\therefore R_{B1} = 47k\Omega$$

3. 微变等效电路如图：



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

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

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

$$R_o = R_C = 3k\Omega$$

2-16:

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

$$R_i = R_{B1} // R_{B2} // r_{be}$$

其中: $r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}} \approx (1+\beta)\frac{26mV}{I_{EQ}}$

$$I_{EQ} \approx \frac{U_B - U_{BE}}{R_E}$$

1. 增大β, I_E 几乎不变

$$A_u = -\frac{\beta R_C // R_L}{r_{be}} \approx -\frac{(R_C // R_L) I_{EQ}}{26mV}$$ 几乎不变

$R_i = R_{B1} // R_{B2} // r_{be}$ 增大

2. 增大R_E, I_E 减小

$A_u \approx -\frac{(R_C // R_L) I_{EQ}}{26mV}$ 减小

$R_i = R_{B1} // R_{B2} // r_{be}$ 增大

2-1]: $U_B =$

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

(1) $R_E = 0$

$$I_E = \frac{U_B - 0.7V}{R_E + R_{E1}} = 1.42mA$$

$$r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_E} = 1.21k\Omega$$

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

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

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

(2) $R_E = 200\Omega$

$$I_E = \frac{U_B - 0.7V}{R_E + R_{E1}} = 1.18mA$$

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

$$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{-\beta(R_L // R_C)}{r_{be} + (1+\beta)R_E} = -15.5$$

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

由上对比：当 R_E 增大时，电路的电压增益 $|A_u|$ 减小，输入电阻 R_i 增大

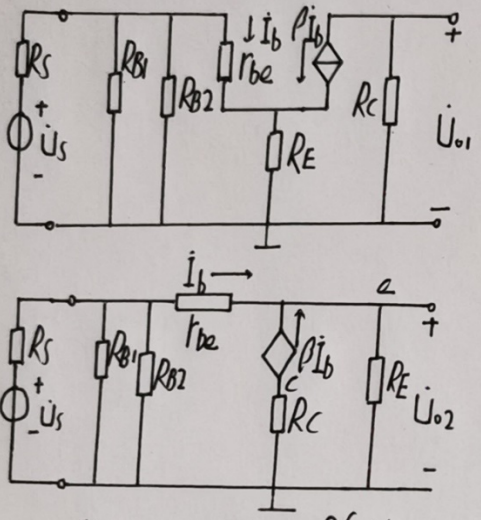
2-8：

1. $U_B = \frac{R_{B2}V_{cc}}{R_{B1}+R_{B2}} = 4.3V$

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

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

2. 集电极和射极输出的微变等效电路分别如下所示：



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

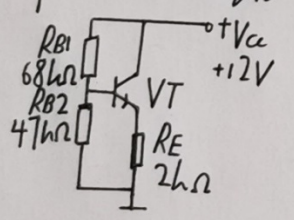
$A_{us1} = \frac{\dot{U}_{o1}}{\dot{U}_S} = \frac{-\beta R_C}{r_{be}+(1+\beta)R_E} \cdot \frac{R_i}{R_i+R_S} = -0.79$

$A_{us2} = \frac{\dot{U}_{o2}}{\dot{U}_S} = \frac{(1+\beta)R_E}{r_{be}+(1+\beta)R_E} \cdot \frac{R_i}{R_i+R_S} = 0.797$

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

$R_{o2} = R_E // \frac{r_{be}+R_S // R_{B1} // R_{B2}}{1+\beta} = 33\Omega$

2-9：1. 直流通路如下：



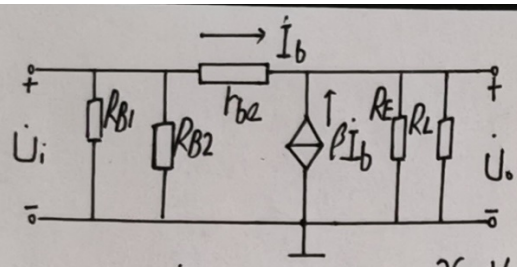
$U_{BQ} = \frac{R_{B2}V_{cc}}{R_{B1}+R_{B2}} \approx 5V$

$I_{EQ} = \frac{U_{BQ} - 0.7V}{R_E} = 2.15mA$

$I_{CQ} = \frac{\beta}{1+\beta} I_{EQ} \approx 2.1mA$

$U_{CEQ} = V_{cc} - I_{EQ}R_E = 7.7V$

2. 微变等效电路如下：



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

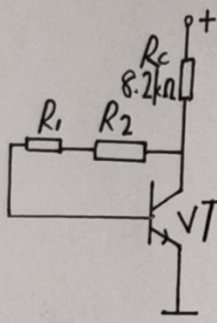
$$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{\dot{I}_e R_L'}{\dot{I}_b r_{be} + \dot{I}_e R_L'} = \frac{(1+\beta)R_L'}{r_{be} + (1+\beta)R_L'} = 0.987$$

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

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

2-24:

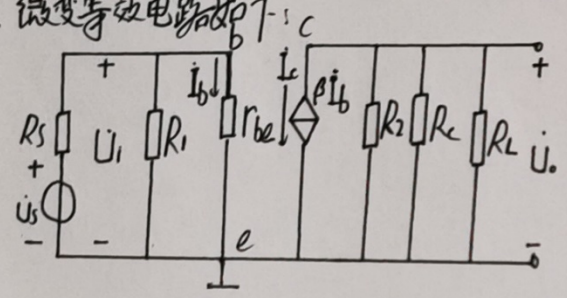
1. 直流通路如下：



$$\begin{cases} I_{BQ} + \beta I_{BQ} = \dfrac{V_{cc} - U_{CEQ}}{R_c} \\ I_{BQ} = \dfrac{U_{CEQ} - U_{BEQ}}{R_1 + R_2} \end{cases}$$

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

2. 微变等效电路如下：



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

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

3. $R_i = r_{be} \parallel R_1 = 1.3k\Omega$

$R_o = R_c \parallel R_2 = 7.3k\Omega$

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

2-25: 1. $I_{CQ} = 1mA \therefore I_{BQ} = 10\mu A,\ I_{EQ} \approx 1mA$

$$\because I_{EQ} = \frac{U_{DQ} - U_{BEQ}}{R_E} = \frac{2.8V}{R_E} = 1mA$$

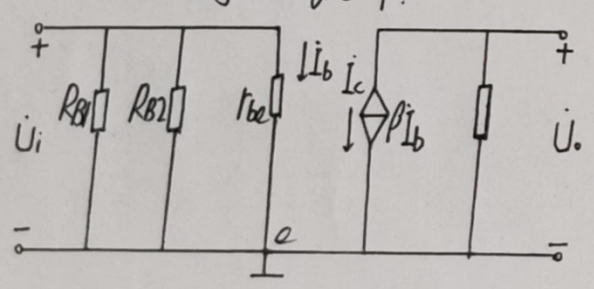
$\therefore R_E = 2.8k\Omega$

$$\begin{cases} U_{BQ} = 5U_{BEQ} = 3.5V = \dfrac{R_{B1} V_{cc}}{R_{B1} + R_{B2}} \\ I_1 (R_{B1} + R_{B2}) = V_{cc} \end{cases}$$

$\therefore R_{B1} = 35k\Omega,\ R_{B2} = 85k\Omega$

$$\therefore R_c = \frac{V_{cc} - U_{DQ} - U_{BEQ1} - U_{CEQ}}{I_{CQ}} = 5.2k\Omega$$

2. 微变等效电路如下：



$$A_u = \frac{-\beta R_c}{r_{be}} = -193$$

$R_i = R_{B2} \parallel R_{B1} \parallel r_{be} = 2.4k\Omega$

$R_o = R_c = 5.2k\Omega$