

作业纸

课程名称: _____

班级: 1909

教学班级: 06011909

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2-4.

∴ A管: $U_x > U_y > U_z$

$U_{CE} = -0.3V$ $U_{CE} = -0.3V$

∴ Y为基极b, X为发射极e, Z为集电极c.

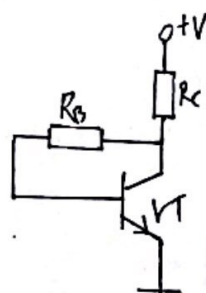
∴ $U_y > U_x > U_z$ $U_{CE} = 0.3$

∴ X为基极b, Z为发射极e, Y为集电极c.

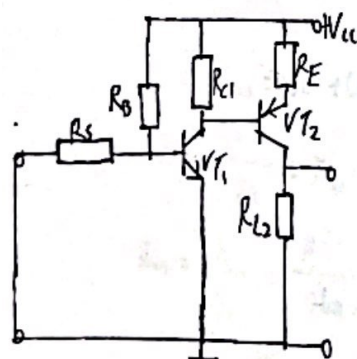
∴ $U_c > U_b > U_e$

∴ 晶体管是NPN型.

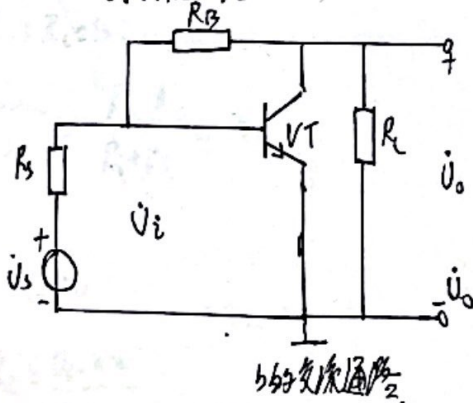
2-8. a的直流通路



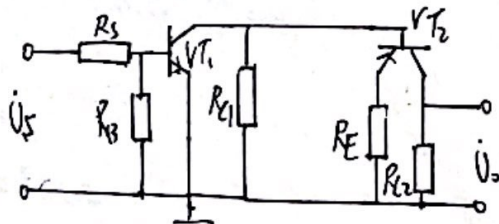
b的直流通路



a的交流通路



b的交流通路



2-7. (a) 不能放大. 没有给 PNP 型晶体管接电源
在 $U_c > U_b > U_e$ 的条件下, 应该将电源改为 $-V_{CC}$,
电容接性对要

(b) 不能放大, 晶体管发射结为零偏置并不是正确.
应将电阻 R_B 与电源 V_{CC} 相连

(c) 不能放大

不能放大. b极接电源致管子处于饱和状态,
而动态时基极交流接地, 输入信号无法进入
晶体管的输入端,

应改成基极和电源 V_{CC} 之间加基极电阻 R_B .

(d) 不能放大, 晶体管无基极偏置电压, 晶体管无
静态信号.

由应将 R_B 断开接入 V_{CC}

(e) 可以放大

(f) 可以放大

(g) 不能放大, 对静态信号和输出电压对地短路.
应在集电极加电阻 R_C .

(h) 不能放大. 输入交流信号时, L_B 会使晶体管基极
对地短路, 导致输入信号无法进入晶体管输入端
应去掉电容 C .

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2-14. (1) $I_{BQ} = \frac{I_{CQ}}{\beta} = 10 \mu A$

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

(2) $r_{be} = r_{bb'} + (1+\beta) \frac{26 mV}{I_{EQ}}$
 $= 100 \Omega + \frac{26}{10} \times 10^3 \Omega = 2700 \Omega$

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

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

$R_o = R_C = 16 k\Omega$

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

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

$I_{CQ} = \frac{-4 mV}{2} = -1.85 mA$

$I_{BQ} = \frac{I_{CQ}}{\beta} = \frac{-1.85}{100} = -0.0185 mA$

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

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

$U_B \approx I_{CQ} R_E = -9.8V$

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

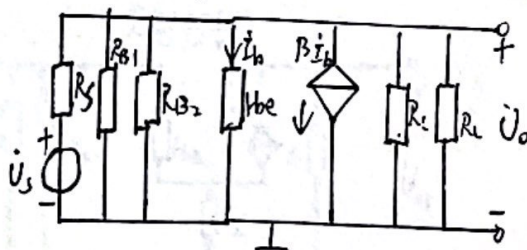
(3) $r_{be} = r_{bb'} + (1+\beta) \frac{26 mV}{I_{EQ}} \approx 1.31 k\Omega$

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

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

$R_o = R_C = 3 k\Omega$

等效电路



2-17. (1) $U_B = \frac{R_{B2} V_{CC}}{R_{B1} + R_{B2}} = 2.12V$

$\frac{1}{2} R_E \approx 0.7V, I_E = \frac{U_B - 0.7V}{R_E + R_E} = 1.42 mA$

$r_{be} = r_{bb'} + (1+\beta) \frac{26 mV}{I_E} = 1.277 k\Omega$

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

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

$R_o = R_C = 8.2 k\Omega$

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(1) 当 $R_E = 200\Omega$ 时 $I_E = \frac{V_B - 0.7V}{R_E + R_{E1}} = \frac{1.8mA}{1.1}$

2-18. (1) $V_B = \frac{R_{B2} V_{CC}}{R_{B1} + R_{B2}} = 4.3V$

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

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

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

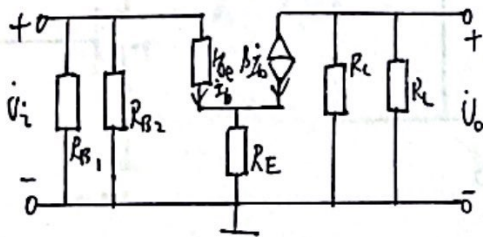
$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{-\beta(R_C \parallel R_L)}{r_{be} + (1+\beta)R_E} = -15.5$

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

$R_o = R_C = 8.2k\Omega$

~~$R_E = 0$ 时 $A_u = -174$ $R_i = 1.63k\Omega$ $R_o = 8.2k\Omega$~~

~~$R_i = 1.63k\Omega$ $R_i = 6.3k\Omega$ $R_o = 8.2k\Omega$~~



当 $R_E = 0$ 时, $A_u = -174$ $R_i = 1.63k\Omega$ $R_o = 8.2k\Omega$

当 $R_E = 200\Omega$ 时, $A_u = -15.5$ $R_i = 6.3k\Omega$ $R_o = 8.2k\Omega$

所以 R_E 对电路性能的影响是 $R_E \uparrow, A_u \downarrow, R_i \uparrow$.

(2) $r_{be} = r_{bb'} + (1+\beta) \frac{26mV}{I_E} = 1.2k\Omega$

$R_i = \frac{\dot{U}_i}{\dot{I}_i} = R_{B1} \parallel R_{B2} \parallel [r_{be} + (1+\beta)R_E] = 8.2k\Omega$

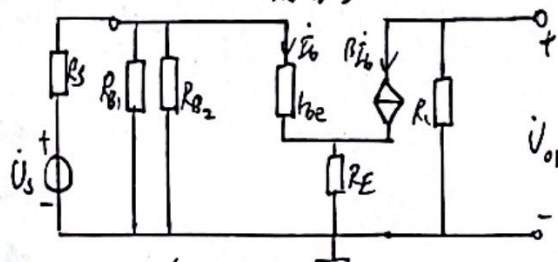
$A_{us1} = \frac{\dot{U}_{o1}}{\dot{U}_s} = \frac{-\beta R_C}{r_{be} + (1+\beta)R_E} \cdot \frac{R_i}{R_i + R_s} = -0.79$

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

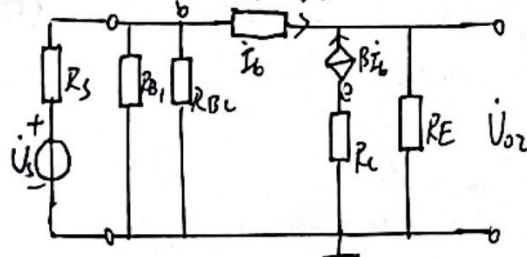
(3) $R_{O1} = R_C = 2k\Omega$

$R_{O2} = R_E \parallel \frac{r_{be} + R_s \parallel R_{B1} \parallel R_{B2}}{1+\beta} = 33\Omega$

发射电路



集电极输出电路



联系方式: _____



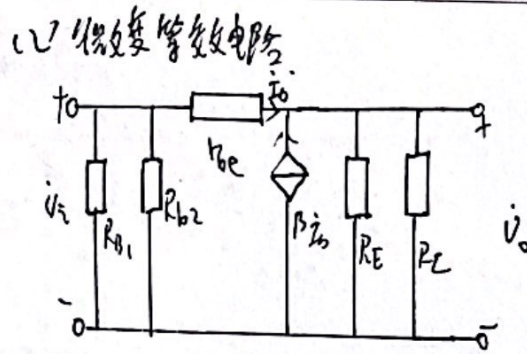
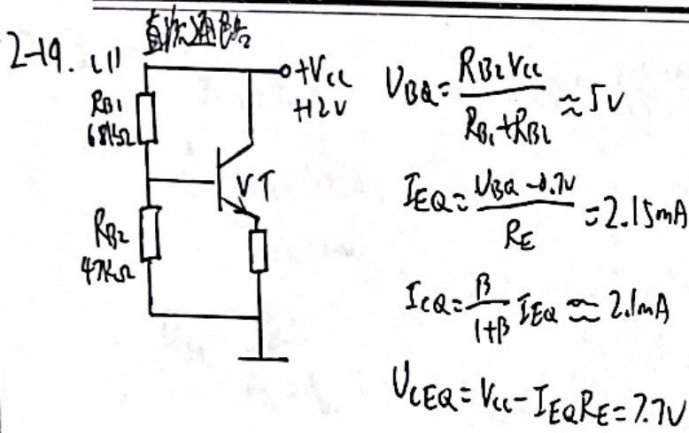
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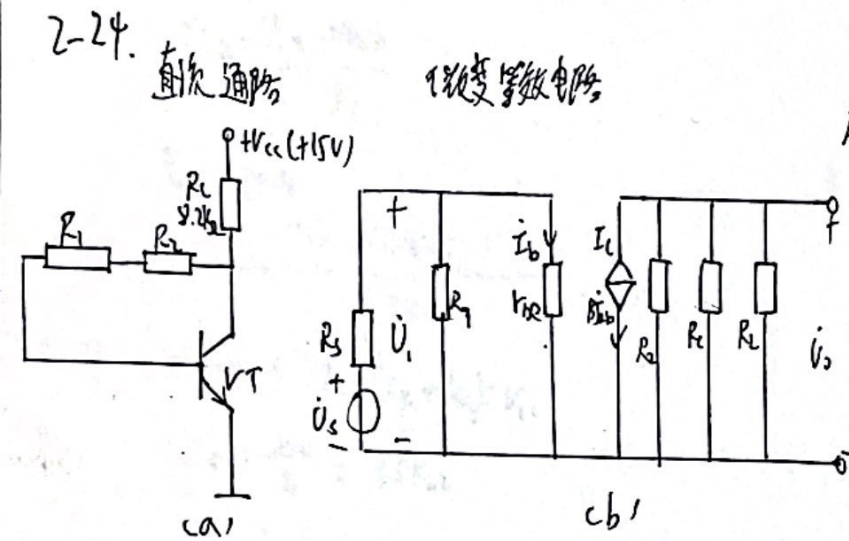


$$h_{be} = h_{be'} + (1+\beta) \frac{26mV}{I_{EQ}} = 1.35k\Omega$$

$$A_u = \frac{\dot{V}_o}{\dot{V}_i} = \frac{(1+\beta) R_L'}{h_{be} + (1+\beta) R_L'} = 0.987$$

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

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



(1) $I_{CQ} = \beta I_{BQ}$

$$I_{BQ} = I_{BQ} + I_{CQ}$$

$$\frac{V_{CC} - V_{CEQ}}{R_c} = I_{BQ} + \beta I_{BQ}$$

$$I_{BQ} = \frac{V_{CEQ} - V_{BEQ}}{2R_1}$$

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

(2) 微变等效电路

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

$$A_u = \frac{\dot{V}_o}{\dot{V}_i} = \frac{-\beta(R_c // R_L // R_2)}{h_{be}} = -149$$

$$R_i = R_1 // R_2 = 1.3k\Omega$$

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

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

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2-20. (11)

$I_{CQ} = 1\text{mA}$
 $I_{BQ} = 10\mu\text{A}$
 $I_{EQ} = 1\text{mA}$

$V_{BQ} = \frac{R_2 V_{CC}}{R_1 + R_2} = 3.5\text{V} = 5 V_{BEQ}$

$I_{EQ} = \frac{V_{BQ} - V_{BEQ}}{R_E} = 1\text{mA}$

$R_E = 2.8\text{k}\Omega$

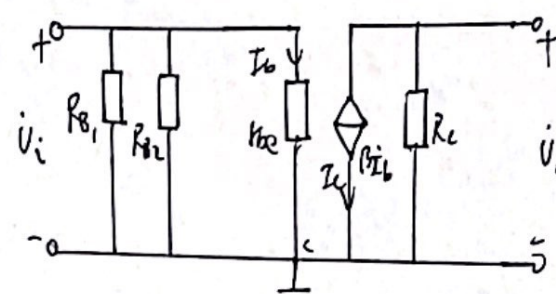
$R_C = \frac{V_{CC} - (V_{BQ} - V_{BEQ}) - V_{CEQ}}{I_{CQ}} = 5.2\text{k}\Omega$

$I_1 = 0.1\text{mA}, I_{CQ}(R_{B1} + R_{B2}) = V_{CC}$

$R_{B1} = \frac{V_{B1}}{I_1} = 35\text{k}\Omega$

$R_{B2} = 85\text{k}\Omega$

(2) 微变等效电路



$A_o = \frac{-\beta R_C}{r_{be}} = -193$

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

$R_o = R_C = 5.2\text{k}\Omega$

思考题

- 21.
1. a b a a
 2. b
 3. a b
 4. a a b
 5. a b

21b. 1. 电阻增大 电压增益不变

2. 电阻增大 电压增益减小

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