

第二章作业 作业纸

课程名称: _____

班级: 1907

教学班级: 1907

姓名: 周树庚

学号: 1120192859 第 _____ 页

2-1

1. a, b, a, a

2. b

3. a, b

4. a a b

5. b

2-4

A管: Y是基极

$$U_X - U_Y = 0.3V$$

∴ X是发射极

Z是集电极

$$∵ U_X > U_Y > U_Z$$

∴ PNP型

B管: X是基极

$$U_X - U_Z = 0.3V$$

Z是发射极

Y是集电极

∴ NPN型

$$U_Y > U_X > U_Z$$

2-7

(a) 不能 不满足PNP型的发射结反偏, 集电结反偏, 应改为 $-V_{CC}$ (b) 不能 应将 R_B 改成基极的上拉电阻.

(c) 不能 不满足发射结反偏, 且动态电路基极接地, 无输出.

应在基极接上拉电阻 R_B .(d) 不能 无直流流过基极, 不满足正常放大, 应将 R_B 上拉至接 V_{CC}

(e) 能

(f) 能

(g) 不能正常放大, 因为交流通路输出对地短路, 不能输出

(h) 不能, 交流通路基极接地短路, 三极管不能正常输出

联系方式: _____



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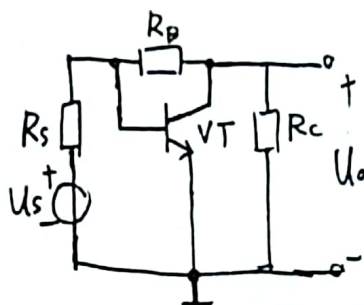
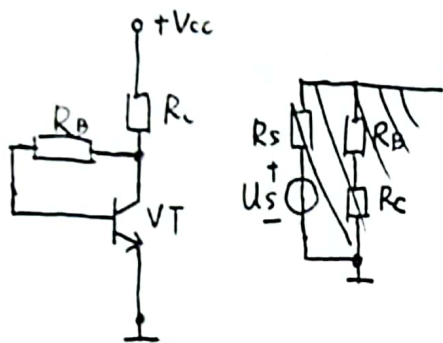
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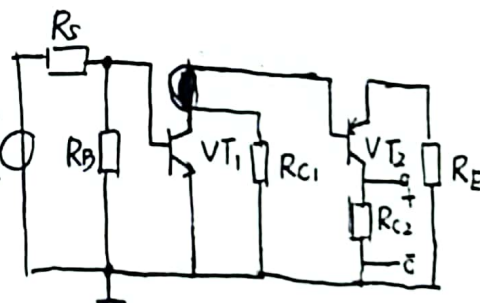
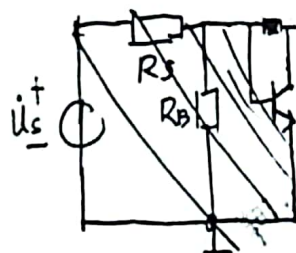
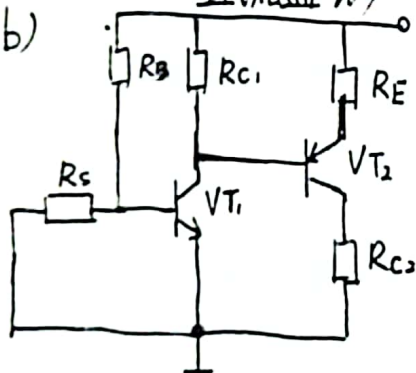
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(a) 直流通路 交流通路

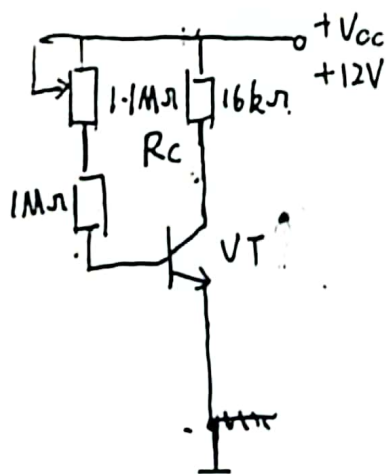


(b) 直流通路 交流通路



2-14

1. 直流通路



$$I_{BQ} = \frac{I_{CQ}}{\beta} = 0.01 \text{ mA}$$

$$U_{BEQ} = 0.7 \text{ V}$$

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

联系方式: _____

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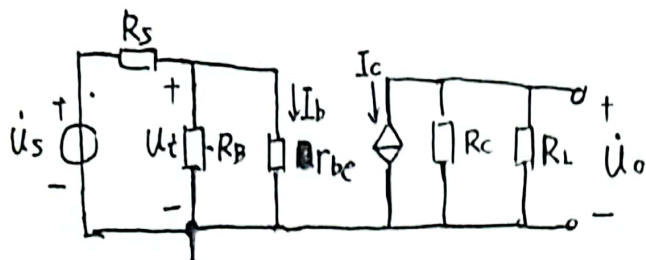
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2.



$$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{-(R_C // R_L) I_c}{I_b r_{be}} \quad \therefore R_i = 2700 \Omega$$

$$r_{be} = r_{bb'} + (1 + \beta) \frac{26 \text{ mV}}{I_{EQ}} \quad \therefore A_{us} = \frac{R_i}{R_i + R_s} A_u = -83$$

$$= 100 \Omega + (1 + \beta) \frac{26 \text{ mV}}{(1 + \beta) I_{BQ}}$$

$$= 2700 \Omega$$

$$A_u = \frac{-(R_C // R_L) \beta}{r_{be}} = -112$$

$$3. R_i = \frac{\dot{U}_i}{\dot{I}_i} = \frac{R_B \cdot r_{be}}{R_B + r_{be}} \approx 2700 \Omega$$

$$R_o \approx R_C = 16 \text{ k}\Omega$$

联系方式: _____



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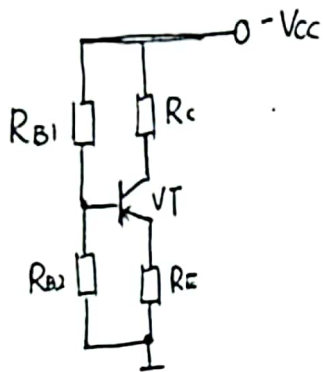
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2-15

1. 直流通路



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

$$= -4V$$

$$I_{CQ} \approx I_{EQ} = \frac{U_B - U_{BE}}{R_E} = -1.85mA$$

$$I_{BQ} = \frac{I_{CQ}}{\beta} = -0.03mA$$

$$U_{CEQ} = -(16V + I_{EQ} R_E + I_{CQ} R_C)$$

$$= -6.75V$$

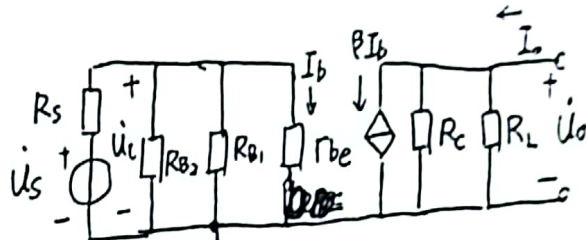
$$2. I_{CQ} = \frac{-V_{CC} - U_{CEQ}}{R_E + R_C} = -2.4mA$$

$$U_B = I_{CQ} R_E + U_{BE} = -5.1V$$

$$U_B = \frac{R_{B2}}{R_{B1} + R_{B2}} (-V_{CC}) = -5.1V$$

$$\text{联系方式: } R_{B1} = 42.7k\Omega$$

3.



$$A_u = \frac{U_o}{U_i} = \frac{-\beta I_b (R_C // R_L)}{I_b r_{be}}$$

$$A_{us} = A_u \frac{R_i}{R_i + R_s} = -55$$

$$R_i = \frac{U_i}{I_i} = R_{B2} // R_{B1} // r_{be}$$

$$= 1.2k\Omega$$

$$R_o = \frac{U_o}{I_o} = R_C = 3k\Omega$$

2-16

1. 电压增益 ~~不变~~ ^{基本不变}, 输入电阻增大。

2. 电压增益减小, 输入电阻增大。



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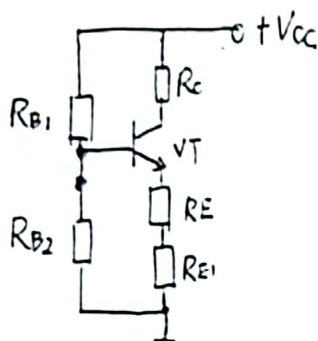
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直流通路



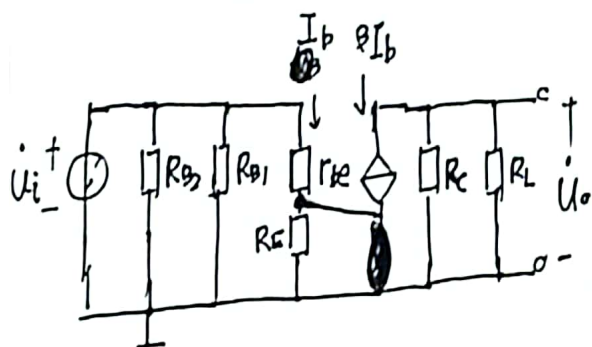
$$U_{BQ} = \frac{R_{B2}}{R_{B1} + R_{B2}} V_{CC} = 2.12V$$

i) $R_E = 0$ 时

$$I_{EQ} = \frac{U_{BQ} - 0.7V}{R_{E1}} = 1.42mA$$

$$r_{be} = r_{bb'} + (1+\beta) \frac{26mV}{I_{EQ}} = 1.22k\Omega$$

交流通路



$$A_u = \frac{U_o}{U_i} = \frac{-\beta I_b (R_C // R_L)}{I_b r_{be} + (1+\beta) I_b R_E} = -174$$

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

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

c2) $R_E = 200\Omega$

$$I_{EQ} = \frac{U_{BQ} - 0.7V}{R_{E1} + R_E} = 1.18mA$$

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

$$A_u = \frac{U_o}{U_i} = \frac{-\beta I_b (R_C // R_L)}{I_b r_{be} + (1+\beta) I_b R_E} = -15.1$$

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

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

 R_E 增大, 电压增益绝对值减小 R_i 增大.

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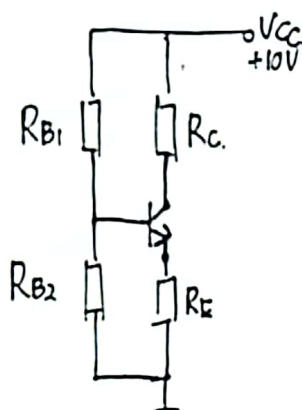
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直流通路

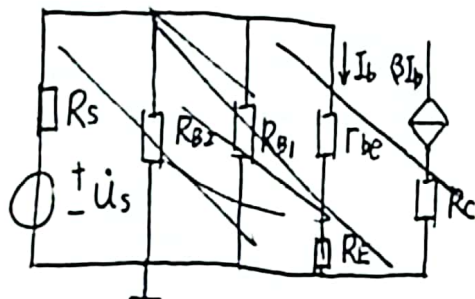


$$1. U_{BQ} = \frac{R_{B2}}{R_{B1} + R_{B2}} V_{CC} = 4.3V$$

$$I_{EA} \approx I_{CA} = \frac{U_{BQ} - 0.7V}{R_E} = 1.8mA$$

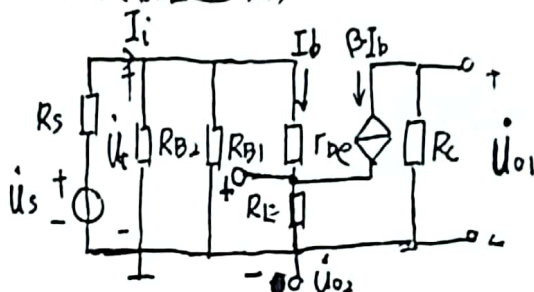
$$U_{CEQ} = V_{CC} - I_{CA} R_C - I_{EA} R_E = 2.8V$$

2. 交流通路



联系方式: _____

2. 交流通路



$$A_{us1} = \frac{\dot{U}_{o1}}{\dot{U}_i} \frac{R_i}{R_i + R_s}$$

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

$$\therefore A_{us1} = \frac{-\beta I_b R_C}{I_b r_{be} + (1+\beta) I_b R_E} = \frac{8.2k\Omega}{8.2k\Omega + 2k\Omega} = -0.79$$

$$A_{us2} = \frac{\dot{U}_{o2}}{\dot{U}_i} \frac{R_i}{R_i + R_s}$$

$$= \frac{(1+\beta) I_b R_E}{I_b r_{be} + (1+\beta) I_b R_E} = \frac{8.2k\Omega}{8.2k\Omega + 2k\Omega}$$

$$= 0.797$$

$$(3) R_i = 8.2k\Omega$$

$$R_{o1} = \frac{\dot{U}_{o1}}{\dot{I}_{o1}} = R_C = 2k\Omega$$

$$R_{o2} = \frac{\dot{U}_{o2}}{\dot{I}_{o2}} = R_E // \frac{r_{be} + R_s // R_{B1} // R_{B2}}{1+\beta} = 33\Omega$$



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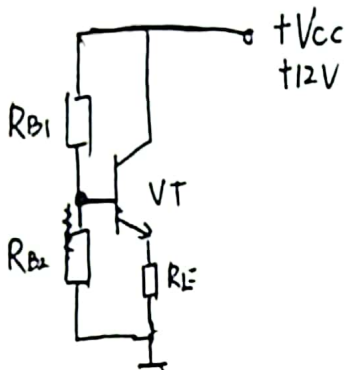
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2-19

1. 直流通路



$$U_{BG} = \frac{R_{B2}}{R_{B1} + R_{B2}} V_{CC} = 5V$$

$$I_{CQ} \approx I_{EQ} = \frac{U_{BG} - 0.7V}{R_E} = 2.1mA$$

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

$$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{(1+\beta)I_b R_E}{I_b r_{be} + (1+\beta)I_b R_E}$$

$$= \frac{R_E (1+\beta)}{r_{be} + R_E (1+\beta)}$$

$$= \frac{R_E (1+\beta)}{R_{B1} \parallel R_{B2} + R_E (1+\beta)}$$

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

$$= 0.987$$

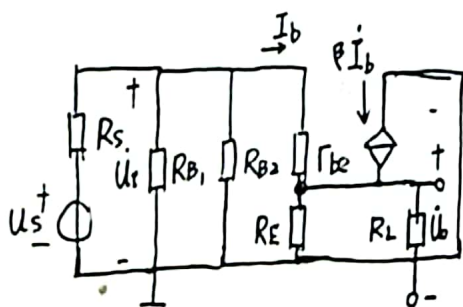
$$R_i = \frac{U_i}{I_i} = R_{B1} \parallel R_{B2} \parallel [r_{be} + (1+\beta)(R_E \parallel R_L)]$$

$$= 21.8k\Omega$$

$$R_o = \frac{U_o}{I_o} = R_E \parallel \frac{r_{be} + R_{B1} \parallel R_{B2} \parallel R_s}{1+\beta}$$

$$= 23.2\Omega$$

2. 交流通路



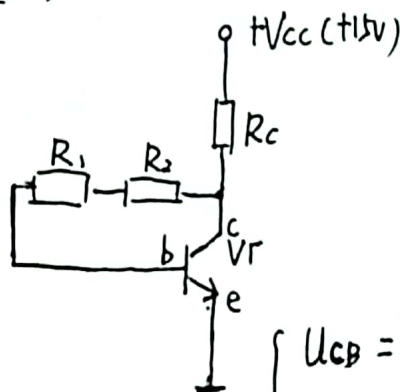
$$A_u = \frac{\dot{U}_o}{\dot{U}_i} =$$

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

联系方式: _____

2-24

1. 直流通路



$$U_{BE} = 0.7V$$

$$U_C = 4V$$

$$\begin{cases} U_{CB} = I_B (R_1 + R_2) \\ R_1 = R_2 \\ (1+\beta)I_B R_C = V_{CC} - U_C \\ = 11 \end{cases}$$



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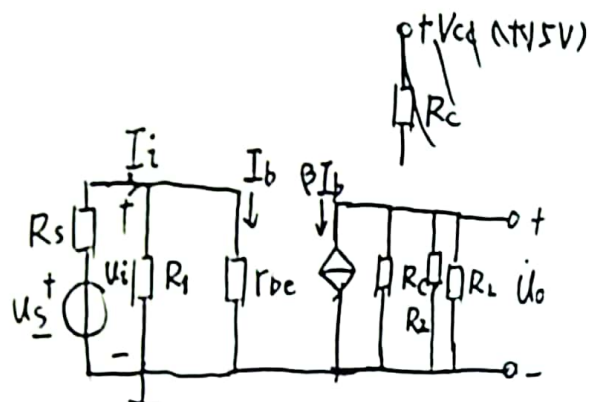
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$$R_1 = R_2 = 62k\Omega$$

2. 交流通路



$$A_u = \frac{U_o}{U_i} = \frac{-\beta I_b (R_C // R_L // R_E)}{I_b r_{be}}$$

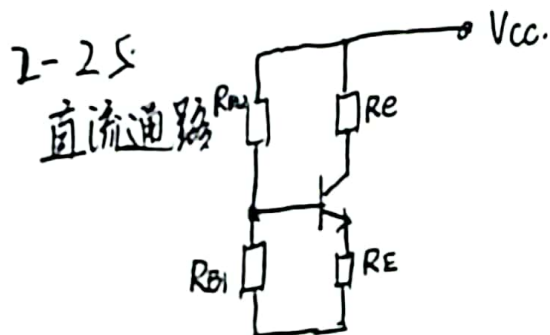
$$r_{be} = r_{bb'} + (1 + \beta) \frac{26mV}{I_{EQ}} = 1.3k\Omega$$

$$\therefore A_u = -149$$

$$A_{us} = A_u \frac{R_i}{R_i + R_s} = -83$$

$$3. R_i = \frac{U_i}{I_i} = R_1 // R_2 // r_{be} = 1.3k\Omega$$

$$R_o = \frac{U_o}{I_o} = R_C // R_L = 7.3k\Omega$$



$$1. U_{BQ} = \frac{R_{B2}}{R_{B1} + R_{B2}} V_{CC} = 3.5V$$

$$\therefore U_{BEQ} = 0.7V$$

$$I_{EQ} \approx I_{CQ} = 1mA$$

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

$$\therefore R_E = 2.8k\Omega$$

$$R_C = \frac{V_{CC} - U_{BQ} + U_{BEQ} - U_{CEQ}}{I_{CQ}} = 5.2k\Omega$$

$$\therefore I_{BQ} = 10\mu A$$

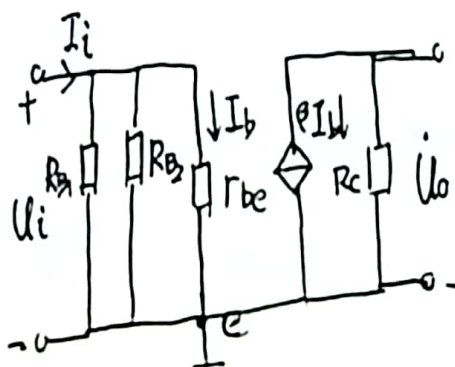
$$\therefore I_1 = 100\mu A$$

$$R_{B1} = \frac{U_{B1}}{I_1}$$

$$I_C (R_{B1} + R_{B2}) = V_{CC}$$

$$\begin{cases} R_{B1} = 35k\Omega \\ R_{B2} = 85k\Omega \end{cases}$$

交流通路



$$R_i = \frac{U_i}{I_i} =$$

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

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

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

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