模电

2.1

1. (a, b, a, a)

2. (b)

3. (a, b)

4. (a, a, b)

5. (b).

2.4.

A管：PNP型

B管：NPN型.

2.7

(a). 不能. 将电阻+V_{CC}改为-V_{CC}. 耦合电容极性反接.

(b). 不能. 将电阻R_B接至+V_{CC}

(c) 可以

(d). 不能. 将R_B断开接至+V_{CC}.

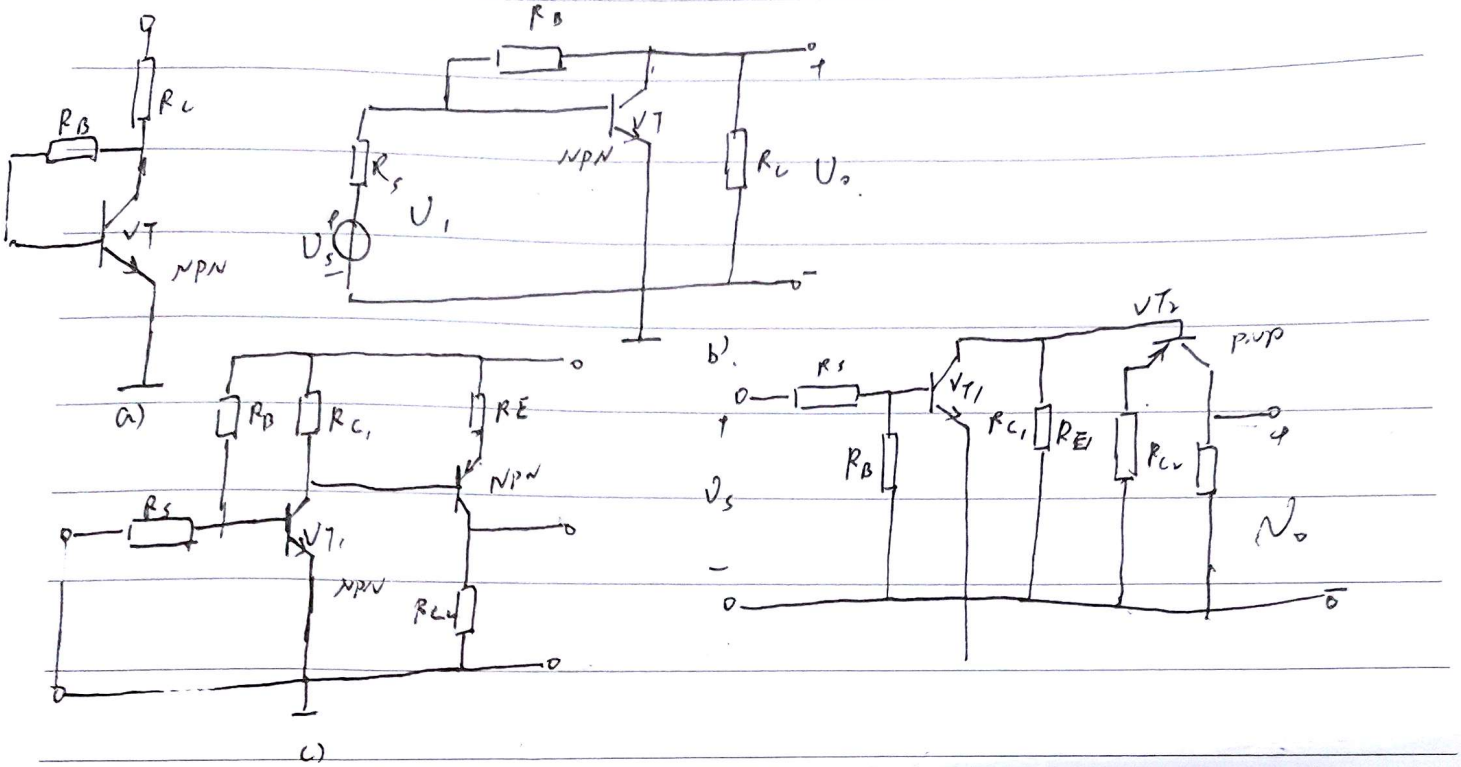
(e) 可以

(f) 可以

(g) 不能. 在集电极加上电阻R_c.

(h) 不能. 应去掉电容C_b

2.8



2.14.

(1) 解: $I_{BQ} = \frac{I_{CQ}}{\beta} = 10\ \mu A$. $R_B = \frac{V_{CC} - U_{BEQ}}{I_{BQ}} = 1.13\ M\Omega$

(2) 解: $r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}} = 2.7\ k\Omega$.

$A_u = \frac{U_o}{U_i} = \frac{-\beta R_L'}{r_{be}} = -112$

(3) 解: $R_i = \frac{U_i}{I_i} = R_B // r_{be} \approx 2.7\ k\Omega$.

$R_o = R_L = 6\ k\Omega$.

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

2.15

1. 解: $U_B \approx \frac{R_{B2}}{R_{B1} + R_{B2}}(-V_{CC}) = -4V$. $I_{CQ} = \frac{U_B + 0.3}{R_E} = -1.85\ mA$

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

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

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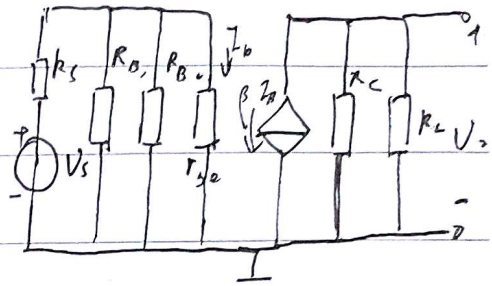
$U_B \approx I_{CQ} R_E = -4.8\,V$ $\quad U_B = \frac{R_{B2}}{R_{B1}+R_{B2}}(-V_{CC}) = -4.8\,V$

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

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

$R_i \approx 1.2\,k\Omega$.

$A_V \approx \frac{U_o}{U_i} = -\frac{R_i}{R_i+R_S}\cdot\frac{\beta(R_L // R_L)}{I_{be}} = -3.5$



2.17.

1. 解: $R_E = 0$. 分析静态工作点.

$I_E = \frac{U_B - 0.7V}{R_{B1}+R_{B2}} = 1.42\,mA$. $\quad r_{be} = r_{bb}' + (1+\beta)\cdot\frac{26mV}{I_E} = 1.217\,k\Omega$

$R_i = \frac{U_i}{I_i} = R_{B1} // R_{B2} // [r_{be} + (1+\beta)R_E] = 1.65\,k\Omega$

$A_U = \frac{U_o}{U_i} = -179$ $\quad R_o = R_C = 8.2\,k\Omega$

2. 解: $I_E = \frac{U_B - 0.7V}{R_E + R_{E1}} = 1.18\,mA$

$r_{be} = 1.4\,k\Omega$. $\quad A_U = -115.5$

$R_i = \frac{U_i}{I_i} = R_{B1} // R_{B2} // [r_{be} + (1+\beta)R_E] = 6.5\,k\Omega$

$R_o = R_C = 8.2\,k\Omega$. $\quad R_E = 0$. $\quad A_V = -179$ $\quad R_i = 1.63\,k\Omega$ $\quad R_o = 8.2\,k\Omega$

$R_E = 200\,\Omega$ $\quad A_U = -115.5$ $\quad R_i = 6.3\,k\Omega$ $\quad R_o = 8.2\,k\Omega$

当射极电阻 R_E 增大时, 电压放大倍数 $|A_U|$ 减小, 输入电阻 R_i 增大

2.18 解: 1. 确定静态工作点. $U_B = \frac{R_{B2}V_{CC}}{R_{B1}+R_{B2}} = 4.3V$ $\quad I_{EQ} = \frac{U_B - 0.7V}{R_E} = 1.8\,mA \approx I_{CQ}$

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

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

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

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$$A_v = \frac{V_o}{V_s} = \frac{-\beta R_L}{r_{be}+(1+\beta)R_E} \cdot \frac{R_i}{R_i+R_s} = -0.79$$

$$A_{vs} = \frac{V_o}{V_s} = 0.797$$

3.解

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

2.19. 1.解 $V_{BQ} = \frac{R_{B2}V_{CC}}{R_{B1}+R_{B2}} \simeq 5V$ $I_{EQ} = \frac{V_{BQ}-0.7V}{R_E} = 2.15mA$

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

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

$A_V = \frac{V_o}{V_i} = 0.987$ $R_i = 21.8K\Omega$.

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

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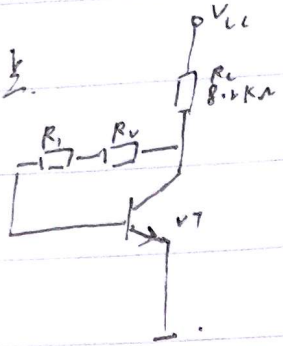
2.2 解

(1) 分析静态工作点

直流通路如下



$I_{CQ} \approx \beta I_{BQ}$

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

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

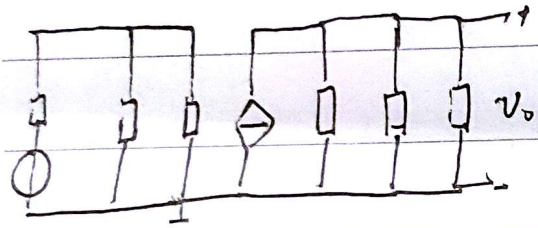
$I_{BQ} = \frac{U_{CEQ} - U_{BEQ}}{R_1}$

$R_1 = R_L = 62\ K\Omega$

(2) 画出微变等效电路如图

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

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



(3) 求出输入、输出电阻

$R_i = r_{be} // R_1 = 1.3K\Omega$　　$R_o = R_C // R_2 = 7.3\ K\Omega$

源电压放大倍数 $A_{US} = \frac{\dot{U}_o}{\dot{U}} = \frac{R_i}{R_i + R_o} \cdot A_U = -83$

2-25

(1) 由已知 $I_{CQ} = 1\ mA$，可得 $I_{BQ} = 10\ \mu A$，$I_{EQ} \approx 1\ mA$

基极电位 $U_{BQ} = \frac{U_{B1} V_{CC}}{R_{B1} + R_{B2}} = 3.5\ V = 5 U_{BEQ}$

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

① $R_E = 2.8\ K\Omega$

② $R_C = 5.2\ K\Omega$.

③ 由于 $I_1 = 0.1\ mA$，$I_1 (R_{B1} + R_{B2}) = V_{CC}$

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$I_1 R_{B1} = V_{B1}$ ⇒ $R_{B1} = 35\ k\Omega$, $R_{B2} = 85\ k\Omega$.

(2) 电路的微变等效电路如下图：

$A_v = \frac{-\beta R_L}{r_{be}} = -193$

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

$R_o = R_L = 5.2\ k\Omega$