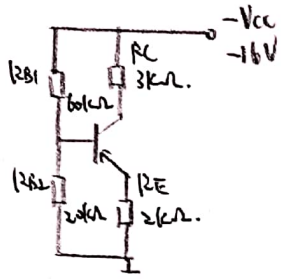
2-1

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

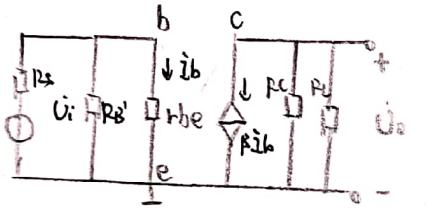
2-16

1.

直流通路



交流通路



$$A_u = \frac{-\beta i_b (R_c // R_L)}{i_b r_{be}} = -\frac{\beta (R_c // R_L)}{r_{be}}$$

$$R_i = R_B' // r_{be}$$

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

放大电路的电压增益增大.

输入电阻增大.

2.

$$U_{B} = V_{CC}\frac{R_{B2}}{R_{B1}+R_{B2}}$$

$$I_{EQ} = \frac{U_B - U_{BEQ}}{R_E}$$

R_E 增大, 则 I_{EQ} 减小

输入电阻增大, 放大电路的电压增益减小

2-4

A. U_X 是发射极

U_Y 是基极

U_Z 是集电极

PNP型

B. U_X 是基极

U_Y 是集电极

U_Z 是发射极

NPN型

06011907
1120180483
张永康

2-7

a) 不能. 不满足发射结正偏, 集电结反偏条件.

将 $+V_{CC}$ 改成 $-V_{CC}$

b) 不能, I_B 流出, 三极管工作在饱和状态, 把 R_B 一端接到 $+V_{CC}$ 上

c) 不能, 输入信号加不进来.

在基极和电源之间加电阻 R_B.

d) 不可以, 静态时, I_B 流出, 无法放大

将 R_B 一端接到 $+V_{CC}$ 上.

e) 能

f) 能

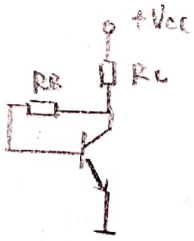
g) 不能, 信号不能经集电极出, 在集电极和 V_{CC} 之间加电阻 R_C

h) 不能, 信号不能输入, 把 C_B 去掉.

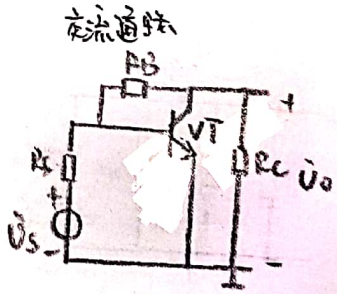
2-8

直流通路.

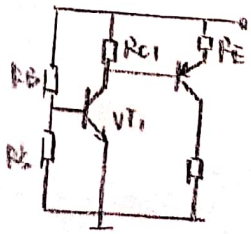
a)

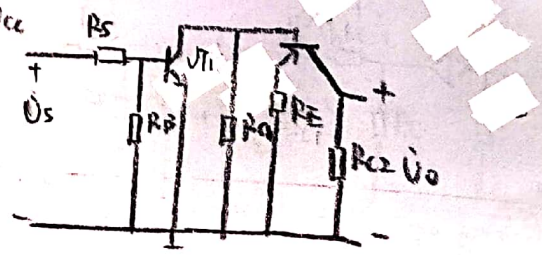


交流通路



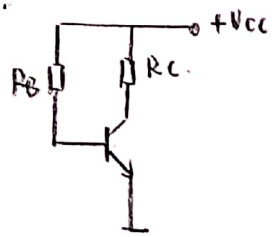
b)





2-14

1.



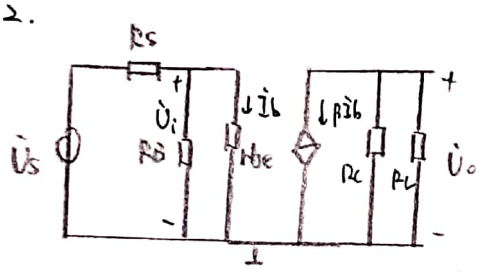
$I_{BQ} = \frac{V_{cc} - U_{BEQ}}{R_B}$

$I_{CQ} = \beta I_{BQ} = \beta \frac{V_{cc} - U_{BEQ}}{R_B}$

$\approx 0.5mA$.

$R_B \approx 1.13M\Omega$.

2.



$A_u = \frac{-\beta \dot{I}_b (R_c // R_L)}{\dot{I}_b r_{be}} = -\beta \frac{R_c // R_L}{r_{be}} = -\beta \frac{R_c // R_L}{r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}}}$

≈ -111.8

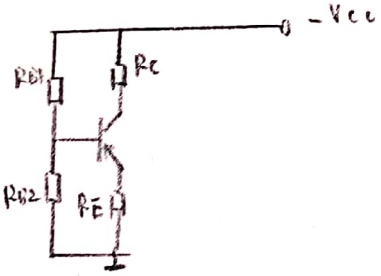
$A_{us} = \frac{\dot{U}_o}{\dot{U}_s} = \frac{\dot{U}_o}{\dot{U}_i} \cdot \frac{\dot{U}_i}{\dot{U}_s} = \frac{\dot{U}_o}{\dot{U}_i} \frac{R_B // r_{be}}{R_s + R_B // r_{be}} \approx A_u \frac{r_{be}}{R_s + r_{be}} \approx -82$

3.

$R_i = R_B // r_{be} \approx r_{be} \approx 2.752\Omega$

$R_o = R_c = 16k\Omega$.

2-15



1. $U_{BQ} \approx -V_{cc} \cdot \frac{R_{B2}}{R_{B1} + R_{B2}}$

$\approx -4V$

$I_{EQ} \approx \frac{U_{BQ} - U_{BEQ}}{R_E}$

$\approx 1.85mA$

$I_{CQ} \approx I_{EQ} = 1.85mA$.

$I_{BQ} = \frac{I_{CQ}}{\beta} \approx 30.8\mu A$ $U_{CEQ} \approx V_{cc} - I_{CQ}(R_c + R_E)$ $= -4.75V$

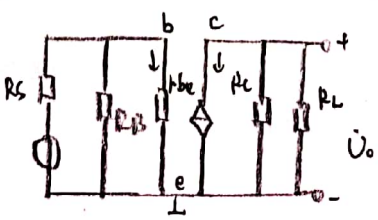
2. $U_{CEQ} = -V_{cc} - I_{CQ}(R_c + R_E)$

$= -V_{cc} - \frac{-V_{cc} \cdot \frac{R_{B2}}{R_{B1} + R_{B2}} - U_{BEQ}}{R_E} \cdot (R_c + R_E)$

$= -4V$

R_{B1} 约 42kΩ

3.



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

$A_u = \frac{-\beta \dot{I}_b (R_c // R_L)}{\dot{I}_b r_{be}} = -\beta \frac{R_c // R_L}{r_{be}} = -125.4$

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

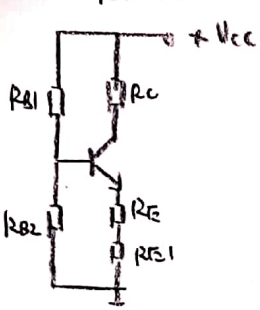
$\approx 0.894\Omega$.

$A_{us} \approx -59$

$R_o = R_c = 3k\Omega$

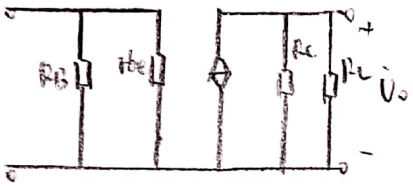
2-17

$I_{EQ}=0$.



$$U_{BQ}\approx V_{cc}\cdot\frac{R_{B2}}{R_{B1}+R_{B2}}=2.12V$$

$$I_{EQ}=\frac{U_{BQ}-U_{BEQ}}{R_E+R_{E1}}=1.42mA.$$

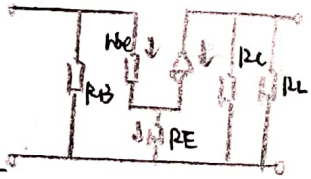


$$A_u=-\beta\frac{R_c/\!/R_L}{r_{be}}=-\beta\frac{R_c/\!/R_L}{r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}}$$

$$=-174$$

$$R_i=R_B/\!/r_{be}$$
$$=1.63k\Omega.$$

$$R_o=R_c=8.2k\Omega.$$



$R_E=200\Omega$.

$I_{EQ}=1.18\ mA$

$$A_u=-\beta\frac{R_c/\!/R_L}{r_{bb'}+(1+\beta)\frac{26mV}{I_{EQ}}+(1+\beta)R_E}$$

$$=-15.5$$

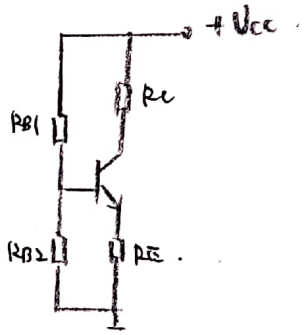
$$R_i=R_B/\!/(r_{be}+(1+\beta)R_E)$$
$$=6.3k\Omega$$

$$R_o=8.2k\Omega.$$

R_E可以使之引入负反馈来稳定工作点的作用，但会降低电路的放大倍数。

2-18

1.



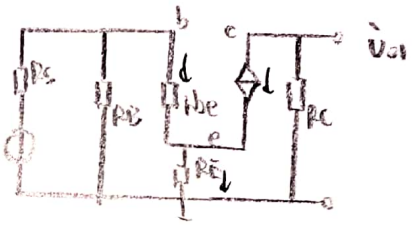
$$U_{BQ}\approx V_{cc}\cdot\frac{R_{B2}}{R_{B1}+R_{B2}}=4.3V$$

$$I_{EQ}=\frac{U_{BQ}-U_{BEQ}}{R_C}$$
$$=1.8mA.$$

$$I_{CQ}\approx I_{EQ}=1.8mA.$$

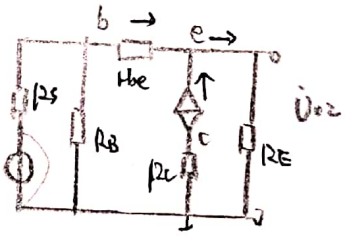
$$U_{CEQ}\approx V_{cc}-I_{CQ}(R_C+R_E)$$
$$=2.8V$$

2.



$$A_{u1}=-\frac{\beta R_C}{r_{be}+(1+\beta)R_E}=-0.97$$

$$A_{us1}=-0.97\frac{R_i}{R_s+R_i}$$
$$=-0.78$$



$$A_{u2}=\frac{(1+\beta)R_E}{r_{be}+(1+\beta)R_E}=0.99$$

$$A_{us2}=0.99\frac{R_i}{R_s+R_i}$$
$$=0.79$$

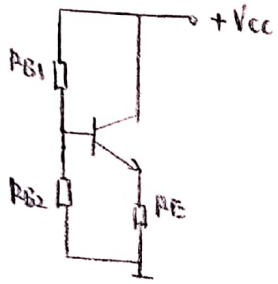
3. $$R_i=R_B/\!/(r_{be}+(1+\beta)R_E)$$
$$=8014\Omega.$$

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

$$R_{o2}=R_E/\!/\frac{R_S/\!/R_B+r_{be}}{1+\beta}$$
$$\approx 44.9\Omega.$$

2-9

1.



$U_{BQ} \approx V_{cc} \cdot \frac{R_{B2}}{R_{B1}+R_{B2}} = 4.9V$

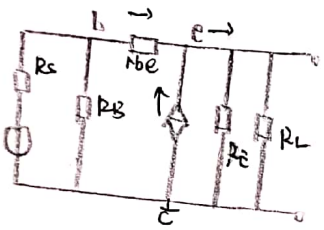
$I_{EQ} = \frac{U_{BQ}-U_{BEQ}}{R_E} = 2.1mA.$

$I_{CQ} \approx I_{EQ} = 2.1mA.$

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

$= 7.8V$

2.



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

$= 0.987$

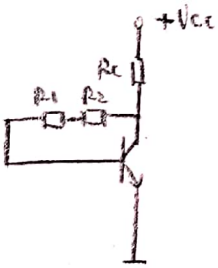
$R_i = R_B // [r_{be}+(1+\beta)R_E//R_L]$

$= 21.8k\Omega.$

$R_o = R_E // \frac{R_s//R_B+r_{be}}{1+\beta}.$

$= 22.7\Omega.$

2-24



$I_{BQ} = \frac{U_{CEQ}-U_{BEQ}}{R_1+R_2}$

$U_{CEQ} = V_{cc} - R_c I_{CQ}$

$= V_{cc} - R_c \beta I_{BQ}$

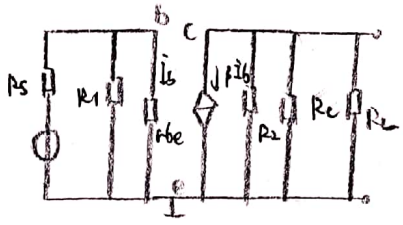
$= V_{cc} - \beta R_c \frac{U_{CEQ}-U_{BEQ}}{2R_1}$

$R_1 = R_2 = 61.5k\Omega.$

$I_{EQ} \approx (1+\beta)I_{BQ} = \frac{U_{CEQ}-U_{BEQ}}{2R_1}(1+\beta)$

$I_{BQ} = 1.37mA.$

2.



$A_u = -\frac{\beta R_2//R_c//R_L}{r_{be}}$

$= -151.6$

$A_{us} = \frac{\dot{U}_o}{\dot{U}_i} \cdot \frac{\dot{U}_i}{\dot{U}_s} = A_u \frac{R_i}{R_i+R_s}.$

$R_i = R_1 // r_{be} = 1242\Omega$

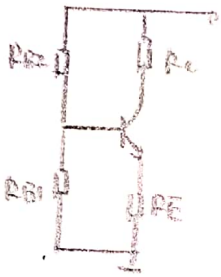
$A_{us} = -84$

3. $R_i = 1242\Omega.$

$R_o = R_2 // R_c$

$= 7.2k\Omega$

2-25



1. $U_{BQ} \approx 5U_{BEQ} = 3.5V$

$I_1 \approx 10I_{BQ} = 10\frac{I_{CQ}}{\beta} = \frac{I_{CQ}}{10}$

$U_{BQ} = I_1 R_{B1} = \frac{I_{CQ}R_{B1}}{10}$

$R_{B1} = 35k\Omega$

$V_{cc} - U_{BQ} = 11I_{BQ}R_{B2}$

$= 11\frac{I_{CQ}}{100}R_{B2}.$

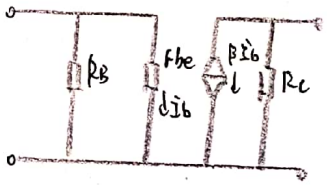
$R_{B2} = 77k\Omega.$

$R_E = \frac{U_{BQ}-U_{BEQ}}{I_{CQ}\frac{1+\beta}{\beta}} = 2.8k\Omega$

$R_c = \frac{V_{cc}-(U_{CEQ}-U_{BEQ}+U_{BQ})}{I_{CQ}}$

$= 5.2k\Omega.$

2.



$A_u = -\frac{\beta R_c}{r_{be}} = -192.6$

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

$= 2.43k\Omega.$

$R_o = R_c = 5.2k\Omega.$