2-1 1. a b a a

2. b. $I_C = \beta I_B$

3. a b

4. a a b

5. b $\beta = 200$ 左右，且反向电流大

2.4. A: $U_x > U_y > U_z$, $U_{xy} = 0.3V$

y：基极. x：发射极. z集电极.

PNP

B: $U_y > U_x > U_z$. $U_{xz} = 0.3V$, NPN型.

x：基极 y：集电极 z：发射极

2.7. (a) PNP型. 其 $U_e < U_b$, 不满足 $U_e > U_b > U_c$, 不能

改：$+V_{cc}$ 改为 $-V_{cc}$, 电容反向

(b) b与e同电压, ~~不能~~ 发射结不偏置

改：R_b 取消接地，改为接 V_{cc}

(c) b相过大. $U_b > U_c > U_e$, 饱和而非放大；且交流时输入 U_i 无 R_b 提供path

改：b与 V_{cc} 间加 R_b

(d). 基极无电流(偏置)，无法放大

R_B 与 e 断开，接到 V_{CC}

(e) 可以放大

(f) 可以正常放大.

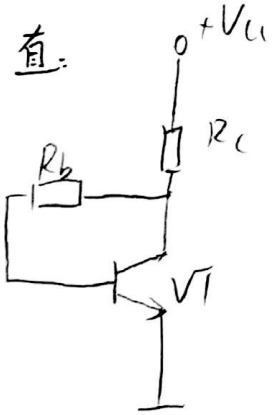
(g) 交流时输出对地短路

改：V_{CC} 与 C 间加 R_C

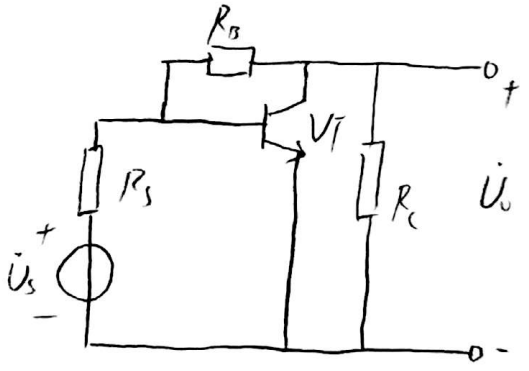
(h) 交流时 C_B 将基极对地短路，无法输入信号

改：去掉 C_B

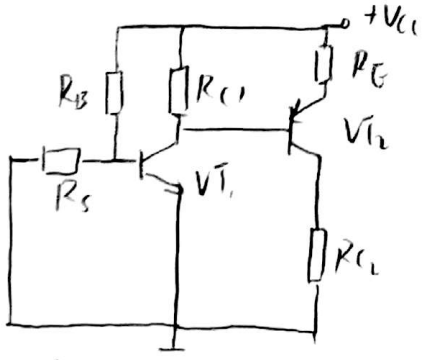
2-8. a). 直：



交：



b) 直



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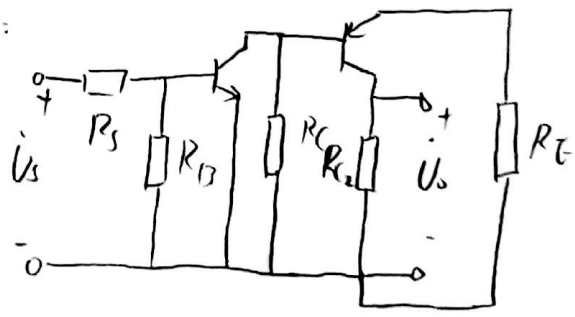
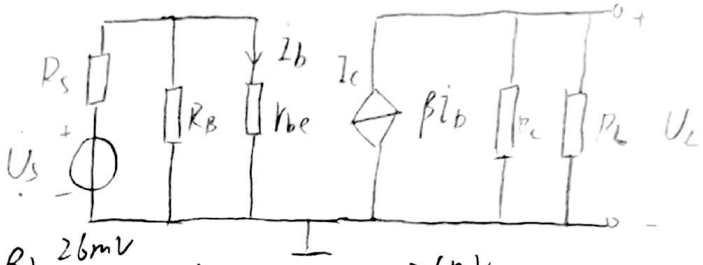


联系方式：_____

2-14. (1) $I_{CQ}=\beta I_{BQ}$ $I_{BQ}=\dfrac{V_{CC}-U_{BE}}{R_B}$

得 $R_B=1.13M\Omega$

(2). 等效.



$r_{be}=r_{bb'}+(1+\beta)\dfrac{26mV}{I_{EQ}}=r_{bb'}+(1+\beta)\dfrac{26mV}{I_{EQ}}\simeq 2700\Omega$

$A_u=\dfrac{\dot U_o}{\dot U_i}=\dfrac{-\beta R_L'}{r_{be}}=\dfrac{-50\times\frac{30}{13}k\Omega}{2.7k\Omega}\simeq -114$

$A_{us}=\dfrac{\dot U_o}{\dot U_s}=\dfrac{R_i}{R_i+R_s}A_u$ $R_i=R_{B1}/\!/r_{be}\approx r_{be}=2700\Omega$

$A_{us}\simeq 83.2$

(3) $R_o=R_C=16K\Omega$

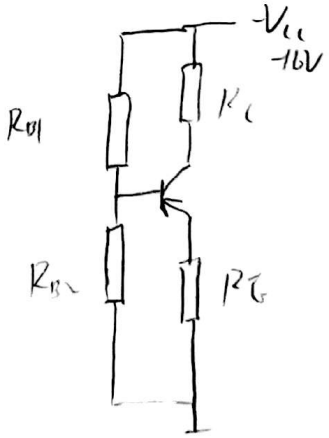
2.15. 1. 直流等效

(2) $U_B=-V_{CC}\times\dfrac{R_{B2}}{R_{B2}+R_{B1}}=-4V$

$I_{EQ}=\dfrac{U_B+U_{BE}}{R_E}=$ ~~2.35mA~~ $1.65mA$

$\beta I_{BQ}=I_{CQ}=I_{CQ}I_{BQ}=$ ~~39.2μA~~ $27.5\mu A$

$U_{CEQ}=V_{CC}-I_{CQ}(R_C+R_E)=$ ~~4.2V~~ $-7.75V$

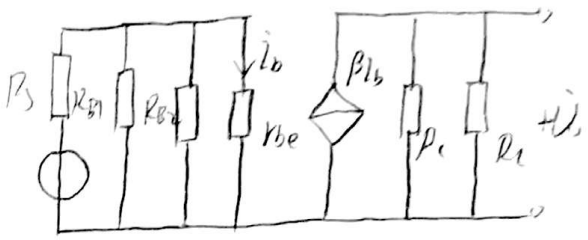


(2) $U_{EBQ} = -4V$. 则 $I_{CQ} = \frac{-V_{CC} - U_{EBQ}}{R_C + R_E} = -2.4mA$

$U_B = I_{CQ}R_E + U_{BEQ} = -5.4V = V_{CC}\frac{R_{B2}}{R_{B1}+R_B}$

得 $R_{B1} = 38.2K\Omega$

2-16(3) 微变等效.



$r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}} \approx 924\Omega$

$R_i = R_{B1} // R_{B2} // r_{be} = 870\Omega$

$R_o = R_C = 3k\Omega$

$A_{us} = \frac{\dot{U}_o}{\dot{U}_i} \cdot \frac{R_i}{R_i + R_s} = -\frac{R_i \cdot \beta (R_C // R_L)}{r_{be}(R_i + R_s)} = -60.42$

2-16(1) 由式易知

$\beta \uparrow$ 则 $A_u = \frac{\beta(R_C // R_L)}{(1+\beta)\frac{26mV}{I_{EQ}}} = \frac{\beta}{1+\beta}\frac{R_L // R_C}{\frac{26mV}{I_{EQ}}}$ $\frac{\beta}{1+\beta} \to 1$.

A_u 应变. R_i 中 $r_{be} \uparrow$, 则 $R_i \uparrow$

(2) $R_E \uparrow$ $A_u = \frac{\beta}{1+\beta}\frac{I_{EQ} R_L // R_C}{26mV} = \frac{\beta}{1+\beta}\frac{U_B - U_{BE}}{R_E}\frac{R_L // R_C}{26mV}$ $A_u \downarrow$

~~R_i~~ $r_{be} \uparrow$, 故 $R_i \uparrow$

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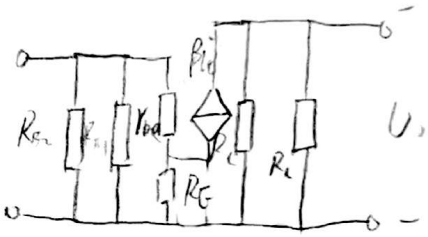
2-17. 直流等效.

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

① $R_E = 0$.　$I_{EQ} = \frac{U_B - 0.7V}{R_E'} = 1.42mA$

$$r_{be} = r_{bb}' + (1+\beta)\frac{26mV}{I_{EQ}} = 1949\Omega$$

微变等效.



$$A_u = \frac{U_o}{U_i} = -\frac{i_b R_L (R_C // R_C)}{(i_b+\beta i_b)R_E + i_b r_{be}} \approx -181$$

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

$R_i = R_{B2} // R_{B1} // r_{be} + (1+\beta)R_E = 1.59k\Omega$

$R_o = R_C = 8.2k\Omega$

② $R_E = 2\omega$ 时，同理

$I_E = 1.18mA$　　$r_{be} \approx 2325\Omega$

$A_u = -\frac{U_o}{U_i} = 15.7$　　$R_i = R_{B2} // R_{B1} // r_{be} + (1+\beta)R_e = 6.34k\Omega$

$R_o = R_C = 8.2k\Omega$

即　$R_E = 0$：　$A_u = -181$　$R_i = 1.59k\Omega$　$R_o = 8.2k\Omega$

$R_E = 2\omega\Omega$：　$A_u = 15.7$　$R_i = 6.34k\Omega$　$R_o = 8.2k\Omega$

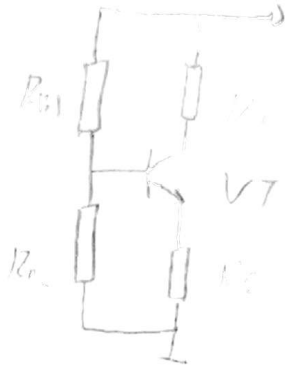
联系方式：_____

2-18 (1) 直流等效

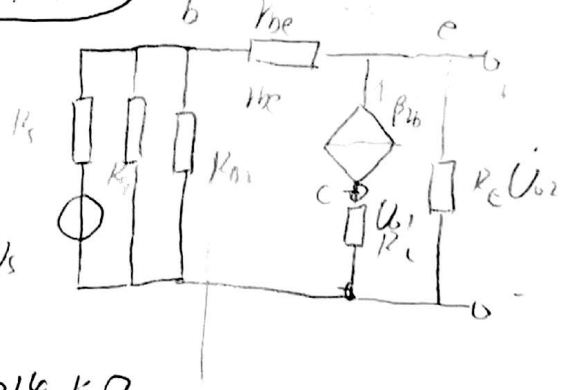
对 b $U_B = \frac{R_{B1}}{R_{B1}+R_{B2}} \times V_{CC} = 4.29V$

$I_{EQ} = \frac{U_B - 0.7V}{R_E} = 1.79mA \approx I_{CQ}$

$U_{CEQ} = V_{CC} - I_{CQ} \times (R_C + R_E) = 2.84V$



(2) 微变等效 ~~集电极~~ 输出 令 $r_{bb'} = 300\Omega$



$r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_E} = 1186\Omega$

$A_{us} = \frac{U_{o1}}{U_s} = \frac{-\beta I_b R_C}{I_B[r_{be} + (1+\beta)R_E]} \times \frac{R_i}{R_i + R_s} U_s$

$R_i = R_{B1} // R_{B2} // [r_{be} + (1+\beta)R_E] = 8.014 K\Omega$

$A_{us1} \approx -0.78$

~~集电极~~ 射极 $A_{us2} = \frac{\dot{U}_{o2}}{\dot{U}_s} = \frac{(1+\beta)\dot{I}_b R_E}{[r_{be} + (1+\beta)R_E]\dot{I}_b} \cdot \frac{R_i}{R_i + R_s} \approx 0.79$

即 $A_{us1} = -0.78$ $A_{us2} = 0.79$

(3) 输入在(1)中求得 $R_i = 8.014 K\Omega$

$R_{o1} = R_C = 2K\Omega$

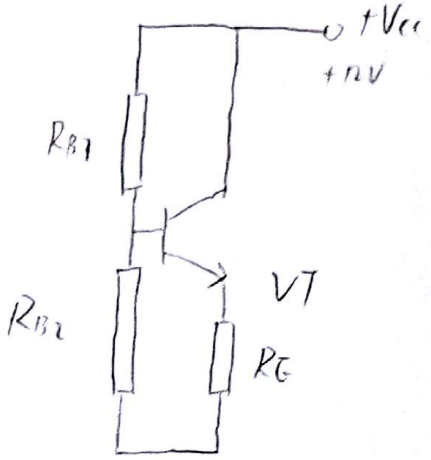
$R_{o2} = R_E // \frac{r_{be} + R_s'}{1+\beta} = 31\Omega$

2.19. (1) 直流等效

$U_b = V_{cc} \times \frac{R_{B2}}{R_{B1}+R_{B2}} = 4.9V$

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

$U_{CEQ} = V_{cc} - I_{EQ}R_E = 4.8V$



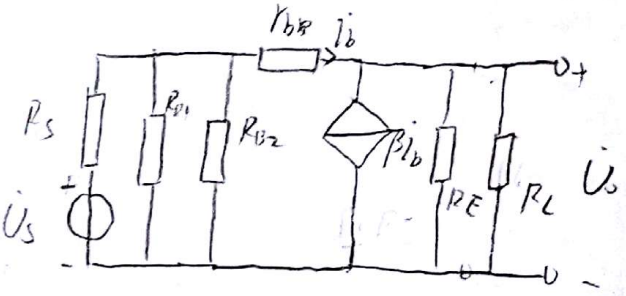
(2) 微变等效

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

$= 1350\Omega$

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

≈ 0.99



~~$R_i = r_{be} + R_S \parallel R_{B1} \parallel R_{B2} =$~~

$R_i = R_{b1} \parallel R_{B2} \parallel [r_{be} + (1+\beta)R_L'] = 21.9K\Omega$

$R_o = R_E \parallel \frac{r_{be} + R_S \parallel R_{B1} \parallel R_{B2}}{1+\beta} = 10.4\Omega$

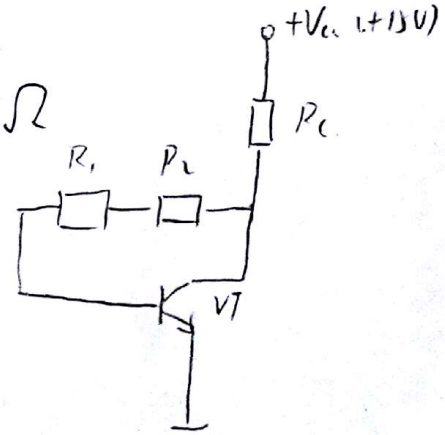
2.24. (1) 直流 设 I_{BQ} 忽略

$I_1 = \frac{V_{cc} - U_{CEQ}}{R_C} = I_{CQ} + I_{BQ}$

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

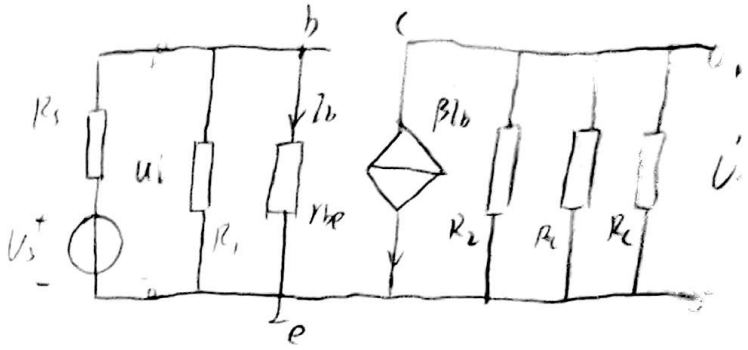
$I_{BQ} = 0.013mA = \frac{U_{CEQ} - U_{BEQ}}{2R_1}$

$R_1 = R_2 = $ ~~125KΩ~~ $62.5K\Omega$



联系方式：_____

(2) 微变等效



$r_{be} = r_{bb}' + (1+\beta_1)\frac{26mV}{I_{CQ}} =$

$= r_{bb}' + \frac{1+\beta}{\beta}\frac{26mV}{I_{BQ}} = 1308\Omega$

$A_u = \frac{U_o}{U_i} = \frac{-\beta I_b (R_C // R_2 // R_L)}{I_b \cdot r_{be}} = -147$

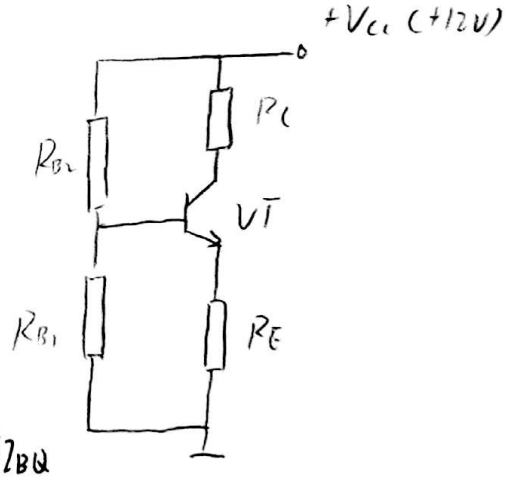
$A_{us} = A_u \cdot \frac{R_i}{R_i + R_s}$

$R_i = R_1 // r_{be} = 1.28K\Omega$

$A_{us} = -82.58$

$R_o = R_C // R_2 = 7.25K\Omega$

2-25. (1) 直流等效.



$U_{BG} = U_{BEQ} + I_{CQ} \times R_E \approx 5U_{BGQ}$

得 $R_E = 2.8K\Omega$

且 $I_{CQ} = \frac{U_{BQ} - U_{BEQ}}{R_E} = 1mA$

~~$V_{CC} - U_{CE}$~~ $I_1(R_{B1} + R_{B2}) = V_{CC}$　$I_{CQ} = \beta I_{BQ}$

$\frac{R_{B1}}{R_{B2} + R_{B1}} = \frac{U_{BQ}}{V_{CC}}$　得 $R_{B1} = 35K\Omega$　$R_{B2} = 85K\Omega$

对 R_C 有　$V_{CC} = R_C I_{CQ} + U_{CEQ} + (U_{BQ} - U_{BGQ})$ 得 $R_C = 5.2K\Omega$

即 $R_{B1} = 35K\Omega$　$R_{B2} = 85K\Omega$　$R_C = 5.2K\Omega$　$R_E = 2.8K\Omega$

联系方式：_____

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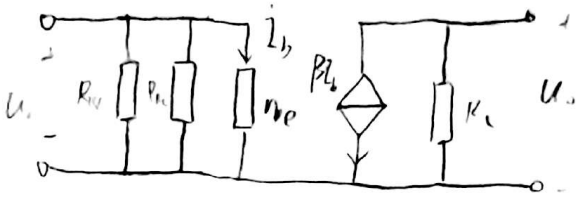
(2) 微变等效



$$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{-\beta i_b R_c}{i_b r_{be}}$$

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

$$R_i = R_{B1} // R_{B2} // r_{be} \approx 2.43K\Omega$$

$$R_o = R_c = 5.2K\Omega$$

联系方式：_____