2-1. 1. a. b. a. a

2. b.

3. a. b.

4. a. a. b.

5. b.

2-4. A管 $U_X > U_Y > U_Z$. $U_{YX} = -0.3V$. ∴ Y为基极. X为发射极. Z为集电极. 为PNP型.

B管 $U_Y > U_X > U_Z$. $U_{XZ} = 0.3V$. ∴ X为基极. Z为发射极. Y为集电极. 为NPN型.

2-7. (a) 晶体管在放大区的条件为发射结正偏. 集电结反偏. PNP管应满足 $U_e > U_b > U_c$. 电路不能正常放大. 将 V_{CC} 改接为 $-V_{CC}$. 电容极性反接

(b) 晶体管的发射结为零偏置. 电路不能正常放大. 将电阻 R_B 接至 V_{CC}.

(c) 晶体管b极电位为 V_{CC}. 处于饱和状态. 且动态时基极交流接地. 输入信号无法进入晶体管. 电路不能正常放大. 将基极电阻加在基极与 V_{CC} 之间.

(d) 晶体管无基极偏置电流. 电路不能正常放大. 将 R_B 接至 V_{CC}

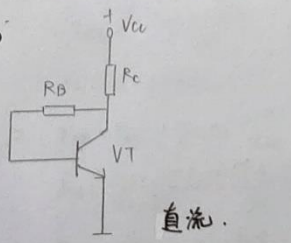
(e) 电路可以正常放大.

(f) 电路可以正常放大.

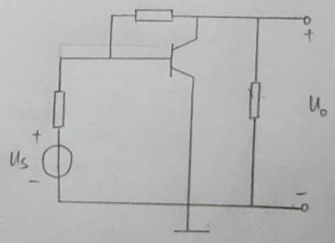
(g) 输入交流信号. 输出电压对地短路. 始终为0. 电路不能正常放大. 将 R_c 加在集电极.

(h). 输入交流信号. 晶体管基极对地短路. 输入信号无法进入晶体管. 电路不能正常放大. 应去掉(B.

2-8. (a)

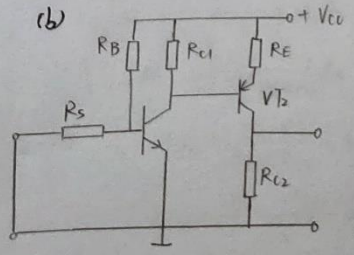


直流.

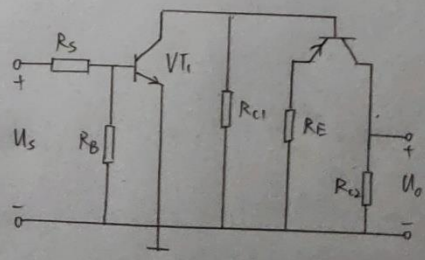


交流.

(b)



直流



交流

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

$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{-\beta R_L'}{r_{be}} = -112$. $A_{us} = \frac{\dot{U}_o}{\dot{U}_s} = \frac{R_i}{R_i + R_s} A_u$

3. $R_i = \frac{\dot{U}_i}{\dot{I}_i} = R_B // r_{be} \approx 2.7k\Omega$. $R_o = R_c = 16k\Omega$ $A_{us} = -83$.

2-15.

1. $U_B = \frac{R_{B2}}{R_{B1}+R_{B2}}(-V_{CC}) = \frac{20k}{60k+20k}\cdot(-16) = -4V$.

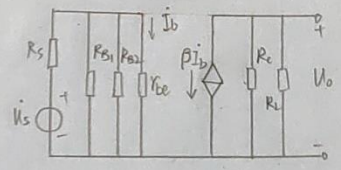
$I_{CQ} = \frac{U_B + 0.3}{R_E} = \frac{-4+0.3}{2k} = -1.85\,mA$.

$U_{CEQ} = -V_{CC} + I_{CQ}(R_c + R_E) = -6.75\,V$.

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

$U_B \approx I_{CQ} R_E = -2.4mA \cdot 2k = -4.8V$.

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



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

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

$A_{us} = \frac{\dot{A}_o}{\dot{U}_s} = -\frac{R_i}{R_i + R_s}\frac{\beta(R_c // R_L)}{r_{be}} = -55$. $R_o = R_c = 3k\Omega$

2-17 $R_E = 0$ 时. $I_E = \frac{U_B - 0.7}{R_E + R_{E1}} = 1.42mA$

$r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_E} = 1.217k\Omega$

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

$A_u = \frac{\dot{U}_o}{\dot{U}_i} = -\frac{\beta(R_L // R_c)}{r_{be} + (1+\beta)R_E} = -174$ $R_o = R_c = 8.2k\Omega$

$R = 200\Omega$ 时. 代入上式. $I_E = 1.18mA$, $r_{be} = 1.4k\Omega$ $A_u = -15.5$ $R_i = 6.3k\Omega$ $R_o = 8.2k\Omega$

当 R_E 增大时. 电压增益 A_u 减小. 输入电阻 R_i 增大.

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

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

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

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

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

$A_{us1} = \frac{\dot{U}_{o1}}{\dot{U}_s} = \frac{-\beta R_c}{r_{be} + (1+\beta)R_E}\frac{R_i}{R_i + R_s} = -0.79$ $A_{us2} = \frac{\dot{U}_{o2}}{\dot{U}_s} = \frac{(1+\beta)R_E}{r_{be} + (1+\beta)R_E}\cdot\frac{R_i}{R_i + R_s} = 0.797$

3. $R_{o1} = R_c = 2k\Omega$

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

2-19 1. $U_{BQ} = \frac{R_{B2} V_{cc}}{R_{B1} + R_{B2}} = 5V$

$I_{EQ} = \frac{U_{BQ} - 0.7V}{R_E} = 2.15mA$

$I_{CQ} = \frac{\beta}{1+\beta} I_{EQ} = 2.1\ mA$

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

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

$A_u = \frac{\dot{U}_o}{\dot{U}_i} = \frac{\dot{I}_o R_L'}{\dot{I}_b r_{be} + \dot{I}_e R_L'} = 0.987$

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

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

2-24 1. $I_{CQ} = \beta I_{BQ}$

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

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

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

$R_1 = R_2 = 62k\Omega$

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

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

3. $R_i = r_{be} // R_1 = 1.3k\Omega$

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

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

2-25. 1. $U_{BQ} = \frac{R_{B1} V_{cc}}{R_{B1} + R_{B2}} = 3.5\ V = 5\ U_{BEQ}$

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

$R_E = 2.8k\Omega$

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

$I_1 = 10 I_{BQ} = 0.1mA.$ $I_C (R_{B1} + R_{B2}) = V_{cc}$

$R_{B1} = \frac{U_{B1}}{I_1} = 35k\Omega.$ $R_{B2} = 85k\Omega$

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

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

$R_o = R_C = 5.2k\Omega.$