北京理工大学 BEIJING INSTITUTE OF TECHNOLOGY

作 业 纸

课程名称：_____

班级：　　教学班级：　　姓名：　　学号：　　第　页

2-4 A: $U_X > U_Y > U_Z$

$U_{YZ} = -0.3V$　则 Y为基极，X为发射极，Z为集电极

PNP型

B: $U_Y > U_X > U_Z$　$U_{XZ} = 0.3V$

则 X为基极，Z为发射极，Y为集电极

NPN型

2-7. a) 不能

b) 不能，发射结零偏置

c) 不能，基极交流接地

d) 不能，无基极偏置电流

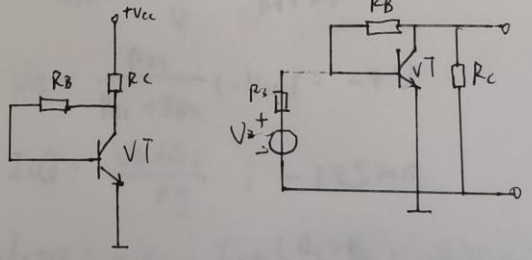
e) 可以

f) 可以

g) 不能，交流输出短路

h) 不能，交流输入无法进入

2-8 a.



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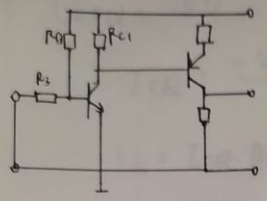
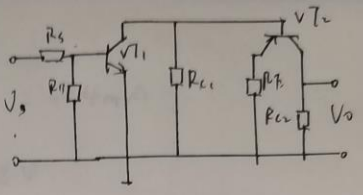
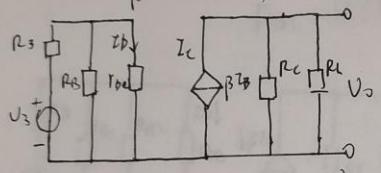




14 1) $I_{BQ} = \frac{I_{CQ}}{\beta} = 10\mu A$, $R_B = \frac{V_{CC} - U_{BEQ}}{I_{BQ}} = 1.13M\Omega$

2)



$r_{be} = r_{bb} + (1+\beta)\frac{U}{I_{EQ}} = 2700\Omega$

$A_u = \frac{\dot{V}_o}{\dot{V}_i} = \frac{-\beta R_L'}{r_{be}} = -112$

输入 $R_i = \frac{\dot{V}_i}{\dot{I}_i} = R_B // r_{be} \approx 2.7k\Omega$

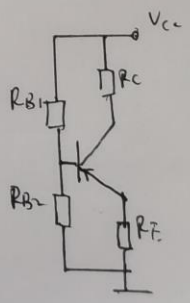
输出 $R_o = R_C = 16k\Omega$

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

15 1) $V_B = \frac{R_{B2}}{R_{B1} + R_{B2}}(-V_{CC}) = -4V$

$I_{CQ} = \frac{V_B + 0.3}{R_g} = -1.85mA$

$V_{CEQ} = -V_{CC} + I_{CQ}(R_C + R_g) = -6.75V$



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课程名称：_____

班级：　　教学班级：　　姓名：　　学号：　　第　　页

7) $U_{CEQ} = -4V$

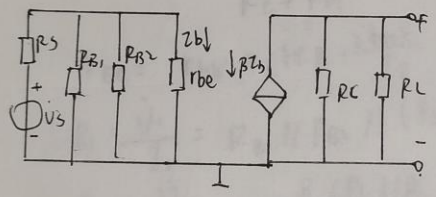
$$I_{CQ} = \frac{-V_{CC} - U_{CEQ}}{R_C + R_E} = -2.4mA$$

$$U_B = I_{CQ} \cdot R_E = -4.8V$$

$$\frac{R_{B2}}{R_{B1} + R_{B2}} \cdot V_{CC} = 4.8V$$

$$R_{B1} = 47K\Omega$$

3)



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

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

$$A_{us} = \frac{\dot{U}_o}{\dot{U}_s} = -\frac{R_i}{R_i + R_s} \cdot \frac{\beta(R_C // R_L)}{r_{be}} = -55$$

$$R_o = R_C = 3K\Omega$$

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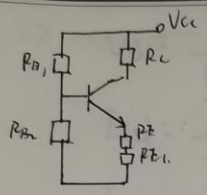
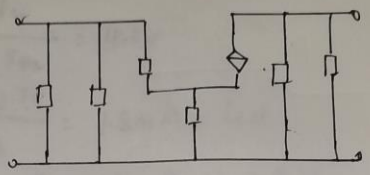
课程名称：_____

班级：　　教学班级：　　姓名：　　学号：　　第　页

17





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

1) $R_E = 0$

$$I_E = \frac{U_B - 0.7V}{R_E + R_{E1}} = 1.42mA$$

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

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

$$A_u = \frac{\dot{V}_o}{\dot{V}_i} = -\frac{\beta (R_L // R_C)}{r_{be} + (1+\beta) R_E} = -174$$

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

2) $R_E = 200\Omega$　　$I_E = 1.18mA$

$$r_{be} = 1.4k\Omega$$

$$A_u = -15.5$$

$$R_i = 6.3\,k\Omega$$

$$R_o = 8.2k\Omega$$

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作业纸

课程名称：_____

班级：　　教学班级：　　姓名：　　学号：　　第　页

18 1) $V_B = \frac{R_{B2}V_{CC}}{R_{B1}+R_{B2}} = 4.3V$

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

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

2) $r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}} = 1.2K\Omega$

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

$A_{u_1} = \frac{U_i}{U_o} = \frac{-\beta R_C}{r_{be}+(1+\beta)R_E} \cdot \frac{R_L}{R_L + R_C} = -0.79$

$A_{u_2} = \frac{U_i}{U_o} = \frac{(1+\beta)R_E}{r_{be}+(1+\beta)R_E} \cdot \frac{R_L}{R_L + R_S} = 0.797$

3) $R_o = R_E // \frac{r_{be} + R_S // R_{B1} // R_{B2}}{1+\beta} = 33\Omega$

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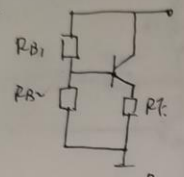
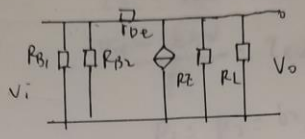
作业纸

课程名称：

班级：　　教学班级：　　姓名：　　学号：　　第　页

19.





(1) $V_B = \frac{R_{B2} V_{CC}}{R_{B1} + R_{B2}} = 5V$

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

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

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

(2) $r_{be} = r_{bb'} + (1+\beta)\frac{26mV}{I_{EQ}} = 1.33k\Omega$

$A_u = \frac{V_o}{V_i} = \frac{I_e R_L'}{I_b r_{be} + I_e R_L'} = 0.987$

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

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

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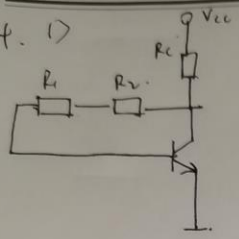
班级：　　教学班级：　　姓名：　　学号：　　第　页

24. 1)

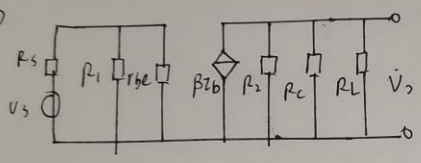


$I_{BQ} = I_{RQ} + I_{CQ}$

$\frac{V_{cc} - V_{CEQ}}{R_c} = I_{RQ} + \beta I_{BQ}$

$R_1 = R_2 = 62\,K\Omega$

2)



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

$A_u = \frac{V_o}{V_i} = \frac{-\beta(R_c // R_L // R_2)}{r_{be}} = -149$

3)　$R_1 = r_{be} // R_1 = 1.3\,K\Omega$

$R_2 = R_c // R_2 = 7.3\,K\Omega$

$A_{VS} = \frac{V_o}{V_s} = \frac{R_1}{R_1 + R_2} A_u = -83$

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