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院系：软件

14级11班

大连理工大学

课程名称：模拟与数字电路　试卷：A卷　考试形式：闭卷

授课院（系）：软件学院　考试日期：2015年4月__日　试卷共6页

题号	1	2	3	4	5	6	7	8	9	总分
标准分	15	5	5	5	5	10	5	5	5	60
得分										

1. 填空

(1). $(101110)_B$ = (46)$_D$ = (2E)$_H$.

(2). $(0010)_B$=(0011)$_{Gray}$; $(15)_D$= (0001 0101)$_{8421BCD}$;

(3). 1010101，偶检验，校验位为 0 ;

(4). P 型半导体中，多子是 空穴 ;PN 结中内电场方向为 N→P ;

(5). D 类功率放大器效率最高;

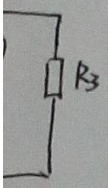
(6). 电压反馈可以稳定输出 电压 ;引入串联反馈，输入电阻 变大 ;

(7). 直流稳压电源一般包括变压、 整流 、 滤波 与 稳压 环节;

(8). 差分放大电路，共模抑制比越 大 越好;

(9). 变压器二次侧电压有效值 U，全波整流电压平均值为 0.9U 。

2. (5%) E_1=40V，E_2=20V，R_1=R_2=4Ω，R_3=13 Ω，试用戴维宁定理求电流 I_3

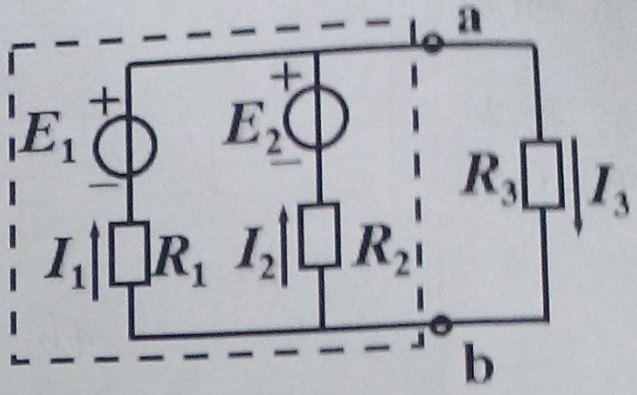


$I = \frac{E_1 - E_2}{R_1 + R_2} = 2.5$ (A)

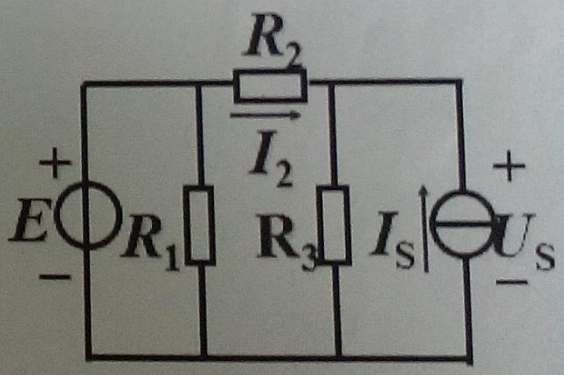
$E_{总} = E_1 - I_2 R_2 = 30$ (V)

$R_{总} = \frac{R_1 R_2}{R_1 + R_2} = 2$ (Ω)

$I_3 = \frac{30}{13+2} = 2$ (A)



3. (5%) E =10V、IS=1A ，R_1=10Ω ,R_2= R_3= 5Ω ，用叠加原理求 R_2 的电流 I_2



1. 断 U_S

$I_{21}(R_2 + R_3) - E = 0$

$I_{21} = 1$ (A)

2. 短 E.

$R_{总} = \frac{R_2 R_3}{R_2 + R_3} = 5$ (Ω)

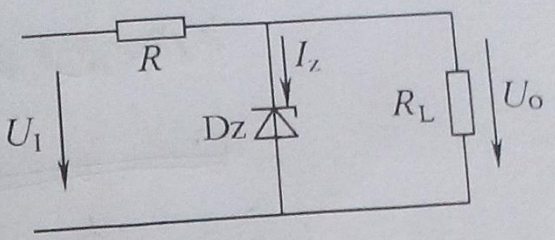
$I_{22} = -\frac{1}{2} \times 1 = 0.5$ (A)

$\therefore I_2 = I_{21} - I_{22} = 0.5$ (A)

4. (5%) 输入电压 U_I=15V 存在±20% 波动，稳压二极管 U_z=6V, I_{zmin}=10mA, I_{zmax}=40mA. R_L=100~250Ω，求限流电阻 R.

$$\begin{cases} U_{max} = (I_{zmax} + iL_{min})R + U_z \\ U_{min} = (I_{zmin} + iL_{max})R + U_z \end{cases}$$

$$iL = \frac{U_z}{R}$$



$R \in [85.7, 187.5]\ \Omega$.

5. (10%) $R_b = 565K\Omega$, $R_C = R_L = 4K\Omega$,

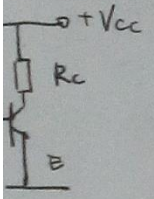
$\beta = 50$, $U_{BE} = 0.7V$, $V_{cc} = 12V$. Note: $r_{be} = 200 + (1+\beta)\frac{26(mv)}{I_{EQ}}$

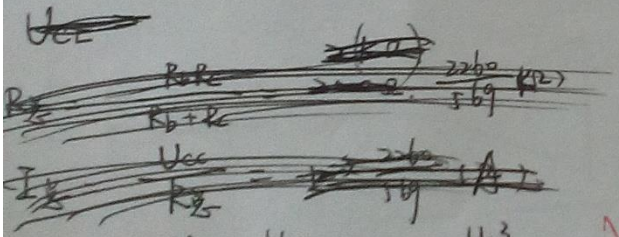
(1) 画直流通路.

(2) 计算静态工作点.

(3) 画交流通路，微变等效电路.

(4) 计算 A_u, R_i, R_o.

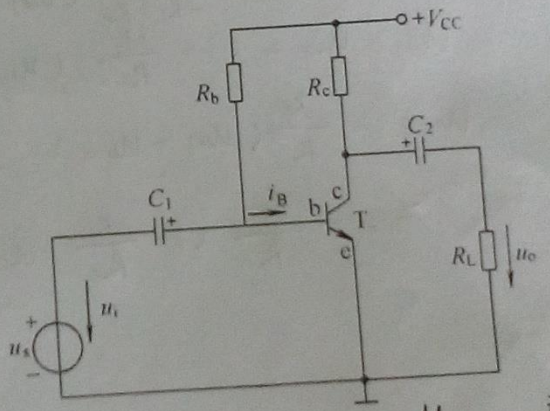


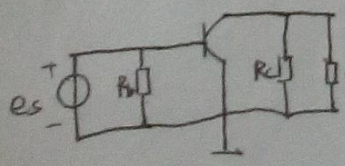


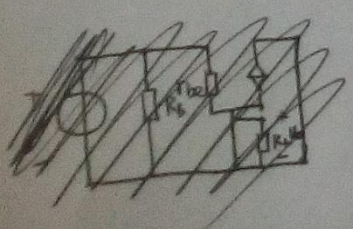
$$I_B = \frac{U_{CC} - U_{BE}}{R_B} = \frac{11.3}{565} = 0.02\ (mA)$$

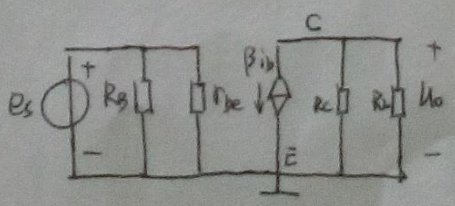
$$I_C = \beta I_B = 1\ (mA)$$

$$U_{CE} = U_{CC} - i_C R_C = 8\ (V)$$









(4) $A_u = \frac{U_o}{U_i} = \frac{-\beta I_b R_L'}{I_b r_{be}} = -\frac{\beta R_L'}{r_{be}}$

$I_E = I_B$ ~~$V_{BE} = 1.83(mA)$~~

~~$r_{be} = 200 + 51 \times$~~ $200 + 51 \times \frac{26}{1.82} = 1500\Omega\ (\Omega)$

$= -\frac{50 \times 2}{1.5k\Omega} = -66.67$

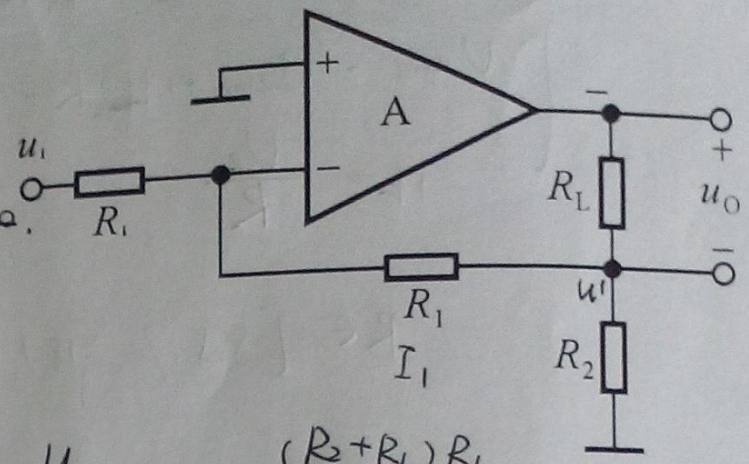
$R_i = R_b // r_{be} = \frac{565 \times 1.5}{565 + 1.5} = 1.5\ (K\Omega)$

$R_o = R_C = 4K\Omega$.

6. (10%)

(1) 判断反馈类型，计算 u_o.

并联电流负反馈.



$$\begin{cases} I_i = \dfrac{u_i - u_-}{R_1} \\ I_1 = \dfrac{u_- - u'}{R_1} \\ u' = \dfrac{R_2}{R_2 + R_L} u_O \\ I_i \approx I_1 \end{cases}$$

$$u_o = -\frac{(R_2 + R_L) R_1}{R_1 \cdot R_2} u_i .$$

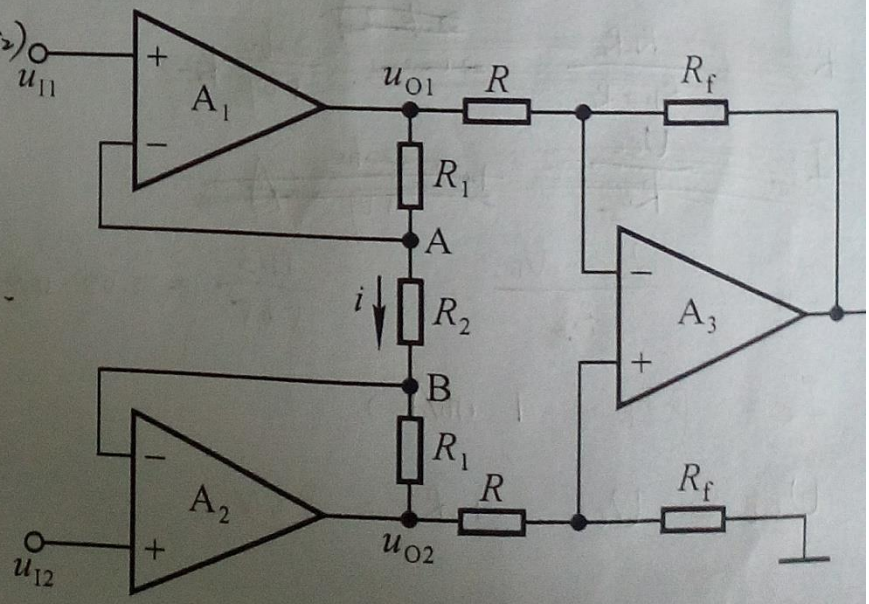
(2) 计算 u_o.

$$u_{I1} - u_{I2} = \frac{R_2}{2R_1 + R_2}(u_{o1} - u_{o2})$$

$$u_{o1} - u_{o2} = \left(1 + \frac{2R_1}{R_2}\right)(u_{i1} - u_{i2})$$

$$u_o = -\frac{R_f}{R}(u_{o1} - u_{o2})$$

$$= -\frac{R_f}{R}\left(1 + \frac{2R_1}{R_2}\right) u_{id} .$$



7. (5%) 开环放大倍数 A = -1000，反馈系数 F = -0.099, dA/A =20%

(1) 闭环放大倍数 A_F

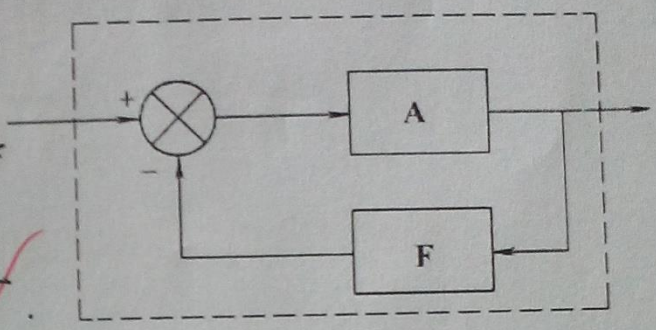
(2) 计算 dA_F/A_F

(1) $|A_f| = \frac{|A|}{1+|AF|} = \frac{1000}{1+1000\times 0.099} \approx 10$

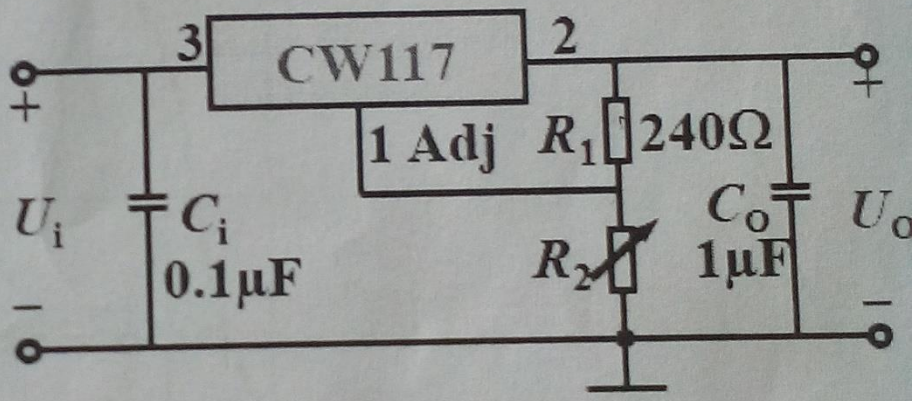
(2) $d\frac{A_f}{A_f} = \frac{1}{1+|AF|}\frac{d|A|}{|A|}$

$= \frac{1}{100} \times 0.2$

$= \frac{1}{5}$



8. (5%) CW117 输出电压 U_{12}=1.5V，求 u_o 变化范围

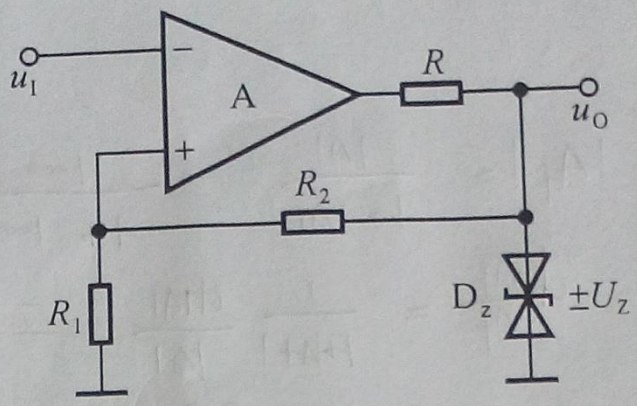


$\frac{R_1+R_2}{R_1} = \frac{U_o}{U_{12}} = \frac{U_o}{1.5}$

$U_o = \frac{1.5(R_1+R_2)}{R_1} = \frac{1.5\times(240+R_2)}{240}$

$U_o \in [1.25, 3]$.

9. (5%) 回滞比较器, R_1=10kΩ, R_2=20kΩ, U_Z=6V.



画 u_o.