第五章作业

5-1

1. 特性曲线　图解

2. 负载功率　直流电源平均功率　25　78.5

3. 甲乙　乙　乙　交越

两管交替工作时，输出波形失真

4. 最大耗散功率 P_{CM}　最大反向击穿电压 $U_{CEO(BR)}$

集电极最大电流 I_{CM}

5. 负载上的功率 P_o

通过输入信号控制直流电源提供的功率

6. 输入信号的幅值　输入信号足够大，输出信号幅值最大且不失真

7. $\frac{2}{\pi}(U_{om})_M$　不是　$\frac{V_{CC}^2}{\pi^2 R_L}$

8. 两个晶体管分别在输入信号的正、负半周工作，使负载得到完整波形

推挽所用晶体管性能对称、型号相反

5-2 甲类：导通角为 360°

乙类：导通角为 180°

甲乙类：导通角大于 180° 小于 360°

单管甲类功放电路最高效率只有 ~~50%~~ 25%。

5-5 1. $U_{om} = 10\sqrt{2}V$ $P_o = \frac{1}{2}\frac{U_{om}^2}{R_L} = 25W$

$P_{Vcc} = \frac{2}{\pi}V_{cc}\frac{U_{om}}{R_L} = 33.76W$ $\eta = \frac{P_o}{P_{Vcc}} \times 100\% = 74.0\%$

单管管耗 $P_T = \frac{1}{2}(P_{Vcc} - P_o) = 4.38W$

2. $(U_{om})_M = 15V$ $(I_{om})_M = \frac{(U_{om})_M}{R_L} = 3.75A$ $(P_o)_M = \frac{1}{2}(U_{om})_M (I_{om})_M = 28.125W$

$I_{CM} \geq (I_{om})_M = 3.75A$

$P_{CM} \geq 0.2(P_o)_M = 5.625W$

$U_{CEO(BR)} > 2V_{cc} = 30V$

5-10. 1. 5V，调节 R_1

2. $(U_{om})_M = \frac{V_{CC}}{2} - U_{CES} = 4V$

$(P_o)_M = \frac{1}{2}\frac{(U_{om})_M^2}{R_L} = 0.5W$

$P_{Vcc} = \frac{1}{\pi} V_{CC} \frac{(U_{om})_M}{R_L} = 0.798W$

$\eta = \frac{(P_o)_M}{P_{Vcc}} \times 100\% = 62.8\%$

3. 若 R_2 或二极管断开，

则 VT_1、VT_2 基极和集电极间电压 $U_{BC} = \frac{V_{CC}}{2} - U_{BE} = 4.3V$

对 VT_1、VT_2：基极电流 $I_B = \frac{U_{BC}}{R_1} = 3.58mA$

$I_C = \beta I_B = 179.2mA$

$(P_T)_M = \frac{V_{CC}}{2} I_C = 895.8mW > 200mW$

~~对 VT_2 同理，~~

∴ VT_1、VT_2 都不安全.

第十章作业

10-5 单相桥式整流电路

$U_{O1M} = \frac{2\sqrt{2}}{\pi} U_2$ $U_{O(AV)} = \frac{2\sqrt{2}}{\pi} U_2 \approx 0.9 U_2 = 18V$

$I_{O(AV)} = \frac{U_{O(AV)}}{R_L} = 18\,mA$

$\therefore$
$I_{D(AV)} = \frac{1}{2} I_{O(AV)} = 9\,mA$
$U_{RM} = \sqrt{2} U_2 = 28.2V$
$U_{O(AV)} = 18V$

VD_1 极性接反，当 U_2 上端电压高时，反向截止，R_L 上无电流，

U_2 下端电压高时，使 VD_3、VD_1 导通，R_L 被短路，

有可能烧坏电路元件。

10-10 1. $U_I = 1.2U_2 = 18V$

$R=0$ 时，稳压管电压为 18V，无法正常工作且易烧坏，

负载两端电压不能稳定。

2. $U_I = 1.2\times(1\pm10\%)U_2 = (18\pm1.8)V$

$U_{Imax} = 19.8V$ $U_{Imin} = 16.2V$

负载 R_L 上 $I_{omax} = 5mA$ $I_{omin} = 0mA$

$$\frac{U_{Imax}-U_Z}{R} - I_{omin} \le I_{Zmax}$$

$$\therefore R \ge \frac{U_{Imax}-U_Z}{I_{omin}+I_{Zmax}} = 363.16\Omega$$

$$\frac{U_{Imin}-U_Z}{R} - I_{omax} \ge I_Z$$

$$\therefore R \le \frac{U_{Imin}-U_Z}{I_{omin}+I_Z} = 680\Omega \qquad \therefore 363.16\Omega \le R \le 680\Omega$$

10-11 1. $U_1 = 1.2\,U_2 \quad \therefore U_2 = \frac{24}{1.2}V = 20V$

2. $U_{B2} = U_Z + U_{BE} = 6.0V$

设 R_{RP} 滑片下端电阻为 R_5，则 $U_o = \frac{R_3+R_4+R_{RP}}{R_5+R_4}$ $\quad 0 \le R_5 \le R_{RP}$

则 $\frac{(R_3+R_4+R_{RP})}{R_{RP}+R_4}U_{B2} \le U_o \le \frac{R_3+R_4+R_{RP}}{R_4}U_{B2}$ 即 $9.0V < U_o < 18.0V$

3. $\frac{R_3+R_4+R_{RP}}{R_4}U_{B2} \ge U_o \quad \therefore U_o \le 24.0V$

$\because U_{Z1} = 24V, \quad U_{CES1} = 2V$

$\therefore U_o \le U_1 - U_{CES1} = 22V$

$\therefore$ 最大为 22V

10-17

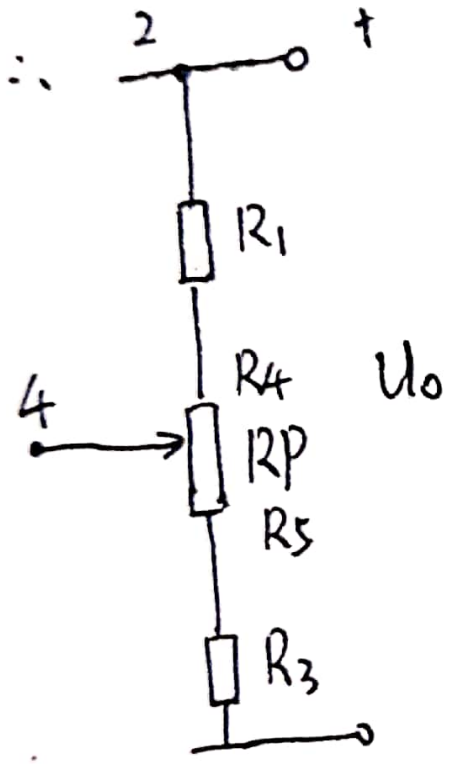
1. a) 稳定输出电流 I_o

b) 稳定输出电压 U_o，同时 U_o 可调.

2. $I_o = \frac{5}{R} + I_3$

3. $U_o = 5(1+\frac{R_2}{R_1}) + I_3R_2$

10-19 $U_{23} = 15V$ $U_{EB} = 0.2V$



$\therefore U_{24} = U_{23} + U_{EB} = 15.2V$

$\therefore U_o = \dfrac{U_{24} \cdot (R_1 + R_3 + R_{RP})}{R_1 + R_4}$

$\because 0 \le R_4 \le R_{RP}$

$\therefore \dfrac{R_1 + R_3 + R_{RP}}{R_{RP} + R_1} U_{24} \le U_o \le \dfrac{R_1 + R_3 + R_{RP}}{R_1} U_{24}$

即 ~~1.35~~ ~~20.52V~~ $\le U_o \le 53.2V$

17.73V