

习题答案

第 1 章

- 1.1 (1) (a) 关联, (b)、(c) 非关联;
(2) (a)、(b) 消耗功率, (c) 发出功率
- 1.2 $10\ \Omega$ 电阻
- 1.3 $50\ \Omega$, 8W
- 1.4 (1) 额定电流: 45.45A , 开路电压: 247.27V ;
(2) 输出电流: 23.33A , 输出电压: 233.27V , 输出功率 5.4kW ;
(3) 输出电流: 95.10A , 输出电压: 190.21V , 输出功率 18kW
- 1.5 **$U_1 = 10\text{V}, U_3 = -2\text{V}, U_6 = 4\text{V}, I_1 = 5\text{A}, I_3 = 4\text{A}, I_6 = 1\text{A}$**
- 1.6 **$P_1 = 16\text{W}, P_2 = 50\text{W}, P_3 = 2\text{W}, P_4 = 36\text{W}, P_5 = 8\text{W}, P_6 = 4\text{W}$** ;
元件 2、5 起电源作用, 元件 1、3、4、6 起负载作用
- 1.7 $V_A = 8\text{V}$, $V_B = 6\text{V}$, $V_C = 18\text{V}$
- 1.8 (a) $U_{ab} = 10\text{V}$; (b) $U_{ab} = -12\text{V}$, $I = 1.6\text{A}$; (c) $U_{ab} = -8\text{V}$, $I = -1.2\text{A}$
- 1.9 $V_A = 12\text{V}$, $V_B = 1\text{V}$, $V_C = -10\text{V}$
- 1.10 选用 $20\ \Omega$ 电阻, $U_2 = 60\text{V}$, $I = 3\text{A}$

第 2 章

- 2.1 (a) $R_{ab} = 9\ \Omega$; (b) $R_{ab} = 3.5\ \Omega$
- 2.2 $I = -1\text{A}$
- 2.3 $U_O = 11\text{V}$
- 2.4 $U = 12\text{V}$
- 2.5 $I = 1\text{A}$
- 2.6 (1) 3 条, 不是, 2 个; (2) 1 个; (3) 1 个, I_S 与 R_1 构成的网孔。

2.7 (1) 1A, 0.9A; (2) $I = -1.2\text{A}$, (3) $I = -1.2\text{A}$

2.8 $U = 18\text{V}$, 无影响。

2.10 $I = 5\text{A}$

第 3 章

3.1 $I = 2\text{A}$, $I_m = 2\sqrt{2}\text{A}$, $\omega = 314\text{rad/s}$, $f = 50\text{Hz}$, $\phi = 60^\circ$

3.2 (2) $\dot{U}_1 = 220\angle 30^\circ\text{V}$, $\dot{U}_2 = 220\angle -90^\circ\text{V}$; (4) $\phi = 120^\circ$

3.3 (1) $\dot{U}_1 = 50\angle 53.1^\circ\text{V}$, (2) $\dot{U}_2 = (190.5 - \text{j}110)\Omega$

(3) $\dot{I}_1 = (1.6 + \text{j}1.2)\text{A}$, (4) $\dot{I}_2 = (-2 - \text{j}2)\text{A} = 2.8\angle -135^\circ\text{A}$

3.4 14.1V, $\sqrt{2}\text{A}$

3.5 (1) $Z = (94.6 + \text{j}55)\Omega$, (2) $R = 94.6\Omega$, $L = 175\text{mH}$

3.6 (1) $X_L = 31.4\Omega$, $X_C = 106.2\Omega$, $Z = (30 - \text{j}74.8)\Omega$

(2) $\dot{U}_R = 30\text{V}$, $\dot{U}_L = \text{j}31.4\text{V}$, $\dot{U}_C = -\text{j}106.2\text{V}$, $\dot{U} = 80.6\angle -68.1^\circ\text{V}$

3.7 $\cos\phi = 0.37$, $P = 29.82\text{W}$, $Q = 74.96\text{var}$, $S = 80.6\text{VA}$

3.8 $R = 92\Omega$

3.9 (1) $\cos\phi = 0.45$; (2) $Q = 88.11\text{var}$, $S = 99\text{VA}$

3.10 $I = 10\text{A}$, $X_C = 12\Omega$, $R_1 = X_L = 8.4\Omega$

3.11 $I_R = I_L = 10\text{A}$, $I_C = 20\text{A}$, $I = 10\sqrt{2}\text{A}$

3.12 (1) $C = 400\text{PF}$, (2) $Q = 261.7$, (3) $U_C = 261.7\text{mV}$, (4) $P = 0.33\text{mW}$,

无功功率为 0。

3.13 $f_0 = 1592.4\text{Hz}$, $Q = 100$

3.14 (1) $\cos\phi = 0.76$, (2) $Q = 66.84\text{Var}$

3.15 $P = 483.5\text{W}$, $Q = 437.8\text{Var}$, $S = 653.4\text{VA}$, $\cos\phi = 0.74$

第 4 章

4.1 $i_A = 4.92\sqrt{2} \sin(\omega t - 63.4^\circ)A$, $i_B = 4.92\sqrt{2} \sin(\omega t - 183.4^\circ)A$,

$i_C = 4.92\sqrt{2} \sin(\omega t + 56.6^\circ)A$, $i_N = 0$

4.2 $\dot{I}_{AB} = 3.1\angle -45^\circ A$, $\dot{I}_{BC} = 3.1\angle -165^\circ A$, $\dot{I}_{CA} = 3.1\angle 75^\circ A$

$\dot{I}_A = 5.4\angle -75^\circ A$, $\dot{I}_B = 5.4\angle -195^\circ A$, $\dot{I}_C = 5.4\angle 45^\circ A$

4.3 $\dot{I}_A = 22\angle 0^\circ A$, $\dot{I}_B = 11\angle -120^\circ A$, $\dot{I}_C = 7.3\angle 120^\circ A$, $\dot{I}_N = 13\angle -14^\circ A$

4.4 $\dot{I}_{AB} = 11\angle 0^\circ A$, $\dot{I}_{BC} = 11\angle -30^\circ A$, $\dot{I}_{CA} = 11\angle 30^\circ A$, $\dot{I}_A = 11\sqrt{3}\angle -30^\circ A$

4.5 $\dot{I}_A = 4.4\angle 0^\circ A$, $\dot{I}_B = 4.4\angle -30^\circ A$, $\dot{I}_C = 4.4\angle 30^\circ A$, $\dot{I}_N = 12\angle 0^\circ A$, $P = 968W$

4.6 $P = 1454W$, $Q = 2903.5\text{var}$, $S = 3247.2VA$

4.7 $P = 8866W$, $S = 8866VA$

4.8 $\dot{I}_A = 2.2\angle -36.9^\circ A$, $\dot{I}_B = 2.2\angle -156.9^\circ A$, $\dot{I}_C = 2.2\angle 81.3^\circ A$

$P = 1161.6W$, $Q = 871.2\text{var}$, $S = 1452VA$

4.9 $U_B = 145V$, $U_C = 232V$, C 相负载烧毁。

第 5 章

5.1 (a) $U_o = 2V$, (b) $U_o = 12V$

5.2 半波整流, 整流作用。

5.3 (1) $U_L = 6V$, (2) $I_L = 6mA$, $I_R = 13mA$, $I_Z = 7mA$,

(3) $I_Z = I_R = 30mA$, $I_Z > I_{Zmax}$, 稳压管烧坏。

5.5 T_1 放大, T_2 饱和, T_3 截止, T_4 饱和

5.6 T_1 为 NPN 型硅管, 1 脚=C, 2 脚=E, 3 脚=B; T_2 为 NPN 型锗管,
4 脚= B, 5 脚=C, 6 脚= E, 两个晶体管都工作在放大状态。

5.7 (1) $I_C = 2mA$, $U_{CE} = 6V$; (2) $I_C = 3.9mA$, $U_{CE} = 0.3V$;

(3) $I_C = 0$, $U_{CE} = 12V$

5.8 $U_{CE} = 6V$ 时, 晶体管工作在放大状态, $U_{CE} = 12V$ 时, 晶体管工作在截止状态, $U_{CE} = 0.3V$ 时, 晶体管工作在饱和状态。

第 6 章

6.3 (1) $I_B = 50\mu A$, $I_C = 2mA$, $U_{CE} = 4V$

(2) $I_B = 75\mu A$, $I_C = 3mA$, $U_{CE} = 0V$; Q 点进入饱和区。

6.4 (2) $A_u = -160$, (3) $r_i \approx 1k\Omega$, $r_o = 4k\Omega$

6.5 (1) 截止失真, (2) 调 R_B , 使其减小。

6.6 (2) $I_B = 45.2\mu A$, $I_C = 2.26mA$, $U_{CE} = 4.09V$

6.7 (2) $A_u = -87.2$, (3) $r_i = 0.81k\Omega$, $r_o = 2k\Omega$

6.8 烧坏晶体管, 在 R_{B1} 支路中串联电位器

6.9 (2) $A_u = -0.97$, (3) $r_i = 11.37k\Omega$, $r_o = 2k\Omega$

6.10 (1) $I_B = 35.3\mu A$, $I_E = 1.45mA$, $U_{CE} = 7.65V$

(2) $A_u = 0.98$, (3) $r_i = 47.6k\Omega$, $r_o = 26.25\Omega$

6.11 (1) $A_u = 0.99$, (2) $r_i = 76.5k\Omega$, $r_o = 26.25\Omega$

6.12 (1) $r_o = 25\Omega$, 电源内阻使输出电阻变大。

6.13 (2) $A_{u1} = -34.38$, $A_{u2} = -93.75$, $A_u = 3223.13$

(3) $r_i = 0.76k\Omega$, $r_o = 2k\Omega$

6.14 (2) $A_{u1} = 0.96$, $A_{u2} = -116.28$, $A_u = -111.63$

(3) $r_i = 17.94k\Omega$, $r_o = 3k\Omega$

6.15 (2) $A_{u1} = -164$, $A_{u2} = 0.99$, $A_u = -162.36$

(3) $r_i = 0.77k\Omega$, $r_o = 125.2\Omega$

第 7 章

7.1 (a) $u_o = -ku_i$, (b) $u_o = ku_i$, (c) $u_o = -(u_{i1} + u_{i2})$, (d) $u_o = u_{i2} - u_{i1}$

7.2 (1) $u_o = (1 + \frac{1+R_F}{10})u_i$, (2) $39k\Omega$, $89k\Omega$

7.3 $u_o = 6V$

7.4 $u_o = 1V$

7.5 (1) $u_{o1} = 2.5V$, $u_{o2} = 2V$, $u_o = -5V$; (2) $R_2 = 16.7k\Omega$

7.12 $u_o = -3V \sim 3V$

7.13 $u_o = u_{i4} - (u_{i1} + u_{i2} + u_{i3})$

7.14 $u_o = 10V$

7.15 (1) $i_L = -\frac{R_2}{R_1 R_S} u_i$; (2) 输出恒流。

第 8 章

8.1 $Y_1 = ABC$, $Y_2 = \overline{A+B+C}$

8.2 $Y_1 = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + ABC\overline{C}$, $Y_2 = \overline{A}\overline{B}\overline{C} + \overline{A}BC + ABC\overline{C}$

8.3 (1) $Y_1 = 1$; (2) $Y_2 = \overline{A}\overline{B} + C$; (3) $Y_3 = B$; (4) $Y_4 = A + \overline{B}C$;

(5) $Y_5 = A + \overline{C}DE$; (6) $Y_6 = A + \overline{B}C + \overline{B}D + B\overline{D}$

8.4 (1) $Y_1 = \overline{A}\overline{B} + \overline{A}C + B\overline{C}$ (不唯一); (2) $Y_2 = \overline{A} + \overline{B} + \overline{C} + D$

(3) $Y_3(A, B, C, D) = \overline{A}\overline{B}\overline{D} + ABC\overline{C} + BCD\overline{D}$;

(4) $Y_4(A, B, C, D) = A\overline{C}D + ABC + \overline{A}B\overline{C} + \overline{A}CD$;

(5) $Y_5 = \overline{B} + C$; (6) $Y_6(A, B, C, D) = B\overline{C} + C\overline{D}$

8.5 $Y_1 = \overline{A}B$ $Y_2 = \overline{\overline{A}B + AB}$ $Y_3 = A\overline{B}$; 两个 1 位二进制数比较电路。

8.6 $Y = \overline{A}\overline{B}\overline{C} + ABC$; 判一致电路。

8.7 $Y = A + \overline{B}C + B\overline{C} = \overline{\overline{A} \cdot \overline{BC} \cdot \overline{BC}}$, 实现电路略。

8.8 $Y = \overline{A}\overline{B}\overline{C} + AB + BC + AC = \overline{\overline{A+B+C} + \overline{A+B} + \overline{B+C} + \overline{A+C}}$, 实现电路略。

8.10 (1) $Y_1 = AC = m_5 + m_7$; (2) $Y_2 = m_1 + m_3 + m_4 + m_7$; (3) $Y_3 = m_0 + m_4 + m_6$

第 9 章

9.6 左移寄存器

9.7 启动时将触发器置成 0001, 第四个二极管点亮。当启动为高电平后, 在时钟 CP 控制下灯循环点亮。

9.8 同步 3 位二进制加法计数器 (同步 8 进制加法计数器)

9.9 9 进制计数器。

9.10 (1) 时钟脉冲由 CP_0 输入, 从 Q_0 输出, 构成 2 进制计数器;

(2) 时钟脉冲由 CP_1 输入, $Q_0=1$, 从 $Q_3Q_2Q_1$ 输出, 又构成 8 进制计数器;

(3) 将 CP_0 和 CP_1 相接, 外加时钟脉冲信号, 分析构成 16 进制计数器。

9.11 (a) 14 进制计数器, (b) 7 进制计数器