

华南理工大学期末考试参考答案与评分标准

《电工与电子技术》(化工类)

一、选择题 (每小题 2 分, 共 16 分)

1、c 2、b 3、a 4、b 5、c 6、c 7、c 8、b

二、(8 分)

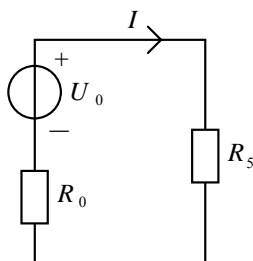
1、求 U_0 (3 分)

$$U_0 = U_{S2} - \frac{R_2}{R_1 + R_2} \times (U_{S1} + U_{S2}) - \frac{R_3}{R_4 + R_3} \times U_{S3} = -30 \text{ V}$$

2、求 R_0 (3 分)

$$R_0 = R_1 // R_2 + R_4 // R_3 = 15 \Omega$$

3、求 I_5 (2 分)



$$I_5 = \frac{U_0}{R_0 + R_5} = -1.5 \text{ A}$$

三、(8 分)

(1) S 闭合前 $X_C = \frac{U}{I} = 440 \Omega$

$$C = \frac{1}{\omega X_C} = 7.24 \mu\text{F} \quad (2 \text{ 分})$$

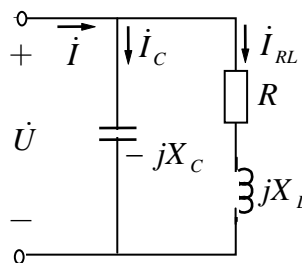
S 闭合后各电流正方向如图所设

$$I_{RL} = \sqrt{\frac{P}{R}} = \frac{1}{\sqrt{2}} \text{ A}$$

$$|Z| = \frac{U}{I_{RL}} = 220\sqrt{2} \Omega$$

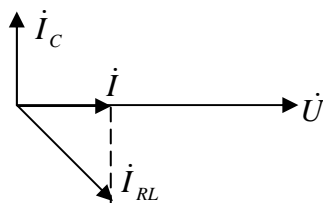
$$X_L = \sqrt{|Z|^2 - R^2} = 220 \Omega$$

$$L = \frac{X_L}{\omega} = 0.7 \text{ H} \quad (2 \text{ 分})$$



(2) $\dot{i} = \dot{i}_C + \dot{i}_{RL} = 0.5 \angle 90^\circ + \frac{1}{\sqrt{2}} \angle -45^\circ = 0.5 \text{ A} \quad (2 \text{ 分})$

(3) 相量图 (2 分)



四、 (8 分)

 负载为 Δ 形连接, $U_p = U_l = 220 \text{ V}$ (1 分)

$$I_p = \frac{I_l}{\sqrt{3}} = 5.77 \text{ A} \quad (1 \text{ 分})$$

$$|Z| = \frac{220}{5.77} = 38.1 \Omega \quad (1 \text{ 分})$$

$$\lambda = \frac{P}{\sqrt{3}U_n I_n} = 0.79 \quad (1 \text{ 分})$$

$$R = 38.1\lambda = 30 \Omega \quad (2 \text{ 分})$$

$$X_L = 23.5 \Omega$$

$$L = \frac{X_L}{\omega} = 75 \times 10^{-3} \text{ H} = 75 \text{ mH} \quad (2 \text{ 分})$$

五、 (8 分)

(1) 可接 220V, 60W 的白炽灯

$$n = \frac{10 \times 10^3}{60} \approx 166.67 = 167 \text{ 盏} \quad (4 \text{ 分})$$

$$(2) \text{原边额定电流 } I_1 = \frac{S}{U_1} = 3.03 \text{ A} \quad (2 \text{ 分})$$

$$\text{副边额定电流 } I_2 = \frac{S}{U_2} = 45.46 \text{ A} \quad (2 \text{ 分})$$

六、 (8 分)

$$(1) T_N = 9550 \frac{P_N}{n_N} = 259.86 \text{ N} \cdot \text{m} \quad (4 \text{ 分})$$

$$(2) T_{stY} = \left(\frac{1}{\sqrt{3}}\right)^2 \times 1.2 \times T_N = \frac{1}{3} \times 1.2 T_N = 104.19 \text{ N} \cdot \text{m} \quad (2 \text{ 分})$$

 负载 T_L 必须小于 $104.19 \text{ N} \cdot \text{m}$ (2 分)

七、 (6 分)

 由 D_1 导通, D_2 截止 (2 分)

$$\text{得 } I_2 = 0, \quad I_1 = \frac{(12+3)}{3} \text{mA} = 5\text{mA} \quad (4 \text{ 分})$$

八、(12 分)

$$(1) I_{C1} = 0.5\text{mA} \approx \frac{15}{R_1} \times 70 \text{ mA} \text{ 故 } R_1 = \frac{15}{0.5} \times 70 \text{ k}\Omega = 2100 \text{ k}\Omega \quad (2 \text{ 分})$$

$$(2) I_{C2} = 1\text{mA} \approx \frac{\frac{15}{R_3 + 20} \times 20 - 0.6}{1.8} \text{ mA} \text{ 故 } R_3 = 105 \text{ k}\Omega \quad (2 \text{ 分})$$

$$(3) A_{u1} = -70 \frac{R'_{L1}}{r_{be1}} \approx -37 \quad (R'_{L1} = R_3 // 20 // r_{be2} // 15) \quad (2 \text{ 分})$$

$$A_{u2} = -70 \frac{R'_{L2}}{r_{be2}} \approx -119 \quad (R'_{L2} = 6.8 // 6.8) \quad (2 \text{ 分})$$

$$A_u = A_{u1} \times A_{u2} = 4403 \quad r_i = R_1 // r_{be1} \approx r_{be1} = 3 \text{ k}\Omega \quad r_o \approx R_{C2} = 6.8 \text{ k}\Omega \quad (4 \text{ 分})$$

九、电路如图所示，求输出电压 u_o 与输入电压 u_i 之间运算关系的表达式。(6 分)

$$u_{O1} = -\frac{R_F}{R_1} u_i \quad (2 \text{ 分})$$

$$u_{O2} = -\frac{R}{R} u_{O1} = -u_{O1} = \frac{R_F}{R_1} u_i \quad (2 \text{ 分})$$

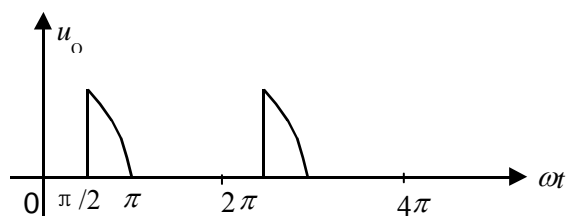
$$u_o = u_{O2} - u_{O1} = \frac{R_F}{R_1} u_i + \frac{R_F}{R_1} u_i = 2 \frac{R_F}{R_1} u_i \quad (2 \text{ 分})$$

十、(7 分)

$$(1) \text{由 } U_o = 0.45 U \cdot \frac{1 + \cos \alpha}{2} \text{ 和 } \alpha = 90^\circ$$

$$\text{可以求出 } U = \frac{2U_o}{0.45} = \frac{2 \times 10}{0.45} \text{ V} = 44.44 \text{ V} \quad (3 \text{ 分})$$

(2) (2 分)



$$(3) I_o = \frac{U_o}{R_L} = \frac{10}{20} \text{ A} = 0.5 \text{ A} \quad (2 \text{ 分})$$

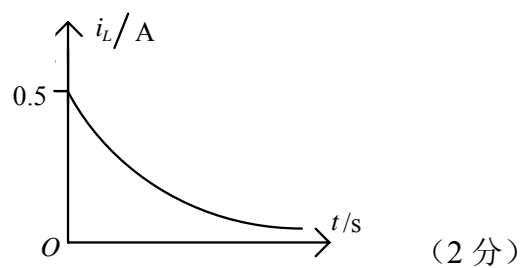
十一、(8 分)

$$i_L(0_+) = i_L(0_-) = \frac{U_s}{R + \frac{RR_1}{R + R_1}} \times \frac{R_1}{R + R_1} = 0.5\text{A} \quad (2 \text{ 分})$$

$$i_L(\infty) = 0 \quad (1 \text{ 分})$$

$$\tau = \frac{L}{R + R_1} = 2\text{ms} \quad (1 \text{ 分})$$

$$i_L(t) = i_L(\infty) + [i_L(0_+) - i_L(\infty)]e^{-\frac{t}{\tau}} = 0.5e^{-500t}\text{A} \quad (2 \text{ 分})$$



十二、(5 分)

