

09 “电路与模电” 期末试题(A)答案

1. (10pt)

由节点 C 可得 $I_1 = 3 \text{ A}$

因此 $I_{EB} = 2 \text{ A}$

由节点 A 可得 $I_{EA} = I_2 + 1$

由节点 D 可得 $I_{DE} = I_2 + 2$

根据 KVL 则有

$$U_{DE} + U_{EA} + U_{AD} = 0$$

即 $I_2 = -1.5 \text{ A}$

根据 KVL 有 $U_{CD} = U_{CB} + U_{BE} + U_{ED} = -8.5 \text{ V}$

2. (10pt)

只有电压源单独作用时:

$$U'_{ab} = \frac{1}{3} \times 10 \sin t \times \frac{1}{2} = \frac{5}{3} \sin t$$

只有电流源单独作用时:

$$U''_{ab} = I \times 1 = \frac{1}{3} \times e^{-t} \times 1 = \frac{1}{3} e^{-t}$$

应用叠加定理求得: $U_{ab} = U'_{ab} + U''_{ab} = \frac{5}{3} \sin t + \frac{1}{3} e^{-t} \text{ (V)}$

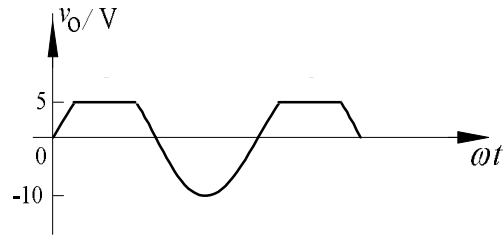
3. (15pt) $-0.8\text{V}, -0.8\Omega$

4. (15pt) $R_L = j\omega L = j * 2\pi f L = j * 2\pi * 100 * 31.8 * 10^{-3} = j10 \Omega$, $R_C = 1/j\omega C = -j10 \Omega$,

$I_L = 10/(10 + j10) = (1 - j)/2 \text{ A}$, $I_C = 10/(10 - j10) = (1 + j)/2 \text{ A}$,

$I = I_L + I_C = 1 \text{ A}$, $U_C = I_C * R_C = ((1 + j)/2) * (-j10) = 5(1 - j) \text{ V}$

5. (10pt)



6. (15pt) Q -point:

$$I_{BQ} = \left(\frac{R_2}{R_2 + R_3} V_{CC} - V_{BEQ} \right) / [R_2 // R_3 + (1+b)R_1]$$

$$\text{Or } I_{BQ} \approx \left(\frac{R_2}{R_2 + R_3} V_{CC} - V_{BEQ} \right) / (1+b)R_1$$

$$I_{CQ} = b I_{BQ}$$

$$V_{CEQ} = V_{CC} - I_{CQ}(R_4 + R_1)$$

$$A_v = \frac{b R_4}{r_{be}}$$

$$R_i = R_1 // \frac{r_{be}}{1+b}$$

$$R_o = R_4$$

7. (15pt) $v_o = v_{o1} - v_{o2}$,

$$v_{o1} = v_i \left(1 + \frac{R_2}{R_1} \right)$$

$$v_{o2} = -\frac{R_4}{R_3} v_i$$

$$v_o = v_i \left(1 + \frac{R_2}{R_1} + \frac{R_4}{R_3} \right)$$

8. (10pt) $v_o = \pm V_Z = \pm 5V$, $\pm V_T = \pm 3V$

