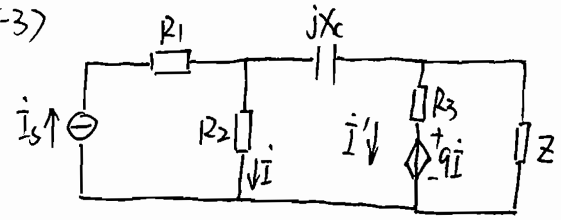
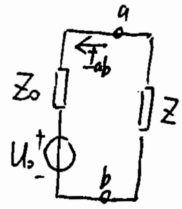
清華大學

5-37)



使用戴维南定理



求开路电压
$$\begin{cases} \dot I + \dot I' = \dot I_s \\ \dot I R_2 = \dot I'(R_3 + jX_c) + 9\dot I \\ \dot U_0 = \dot I' R_3 + 9\dot I \end{cases}$$

$$\dot U_0 = 22.8 + j50.4\,V$$

求等效阻抗
$$\begin{cases} \dot I_{ab} = \dot I' + \dot I' \\ \dot U_{ab} = \dot I' R_3 + 9\dot I = \dot I R_2 + \dot I(jX_c) \end{cases}$$

$$Z_0 = \frac{\dot U_{ab}}{\dot I_{ab}} = 0.12 + j2.16\,\Omega$$

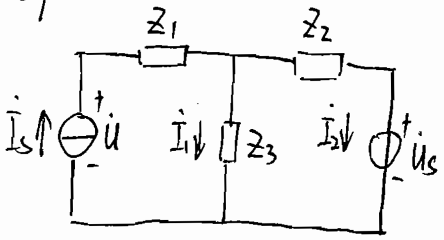
$\therefore$ 当 $Z = Z_0^* = 0.12 - j2.16\Omega$ 时 $P = P_{max} = \frac{|\dot U_0|^2}{4 \times 0.12\Omega} = 6375W$

5-38 (1) $\varphi = 30^\circ$ $\cos\varphi = 0.866$ $P = UI\cos\varphi = 953W$ $Q = UI\sin\varphi = 550var$

(2) $\varphi = 45^\circ$ $\cos\varphi = 0.707$ $P = UI\cos\varphi = 342W$ $Q = UI\sin\varphi = 342var$

(3) $\varphi = \tan^{-1}(\frac{20}{40}) = 26.6^\circ$ $\cos\varphi = 0.894$ $P = UI\cos\varphi = 1000W$ $Q = UI\sin\varphi = 500var$

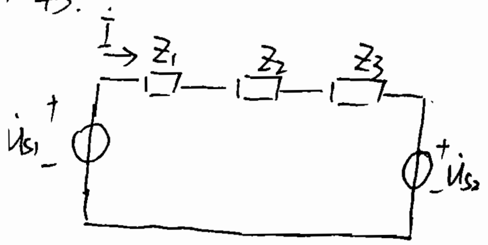
5-39



$$\begin{cases} \dot I_1 + \dot I_2 = \dot I_s \\ \dot I_1 Z_3 = \dot I_2 Z_2 + \dot U_s \\ \dot U = \dot I_1 Z_3 + (\dot I_1 + \dot I_2) Z_1 \end{cases} \Rightarrow \dot U = 317.5 + j150\,V$$

$\therefore \bar S = \dot U \dot I_s^* = 1270 + j600\,VA$ (发出)

5-43.



设 $\dot U_{s2} = 100\angle 0^\circ V$ 则 $\dot U_{s1} = 100\angle 60^\circ V$

$$Z = Z_1 + Z_2 + Z_3 = 6 + j8\,\Omega$$

$$\dot I = \frac{\dot U_{s1} - \dot U_{s2}}{Z} = 3.93 + j9.2\,A = 10\angle 66.9^\circ A$$

$$\bar S_1 = \dot U_{s1} \dot I^* = 993 - j120\,VA$$

$$\bar S_2 = \dot U_{s2} \dot I^* = -393 + j920\,VA$$

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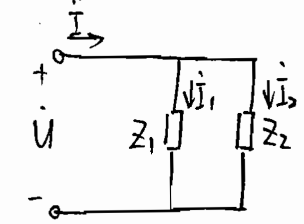
5-44



设 $\dot I_1 = 15\angle 0° A$

$$\dot U = \dot I_1 Z_1 = 120 + j150V = 192\angle 51.3° V$$

$$|\dot I_2| = \frac{P}{|\dot U|\cos\varphi} = 3.72A \qquad \varphi_{I_2} = 51.3° - \arccos 0.7 = 5.7°$$

$$\therefore \dot I_2 = 3.72\angle 5.7°$$

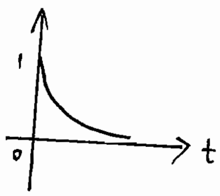
$$\therefore \dot I = \dot I_1 + \dot I_2 = 18.7 + j0.4A = 18.7\angle 1.2° A$$

功率因数 $\cos\varphi = \cos(51.3° - 1.2°) = 0.64$

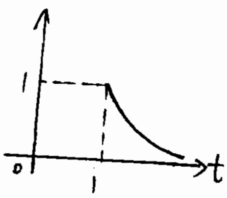
0-1. (a) $f(t) = \underbrace{t[\varepsilon(t) - \varepsilon(t-1)]}_{0-1之间} + \underbrace{(2-t)[\varepsilon(t-1) - \varepsilon(t-2)]}_{1-2之间}$

(b) $f(t) = \underbrace{[\varepsilon(t) - \varepsilon(t-1)]}_{0-1之间} + \underbrace{(2-t)[\varepsilon(t-1) - \varepsilon(t-2)]}_{1-2之间}$

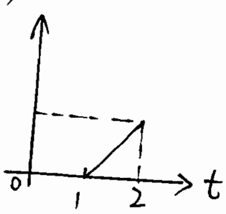
0-2 (a)



(b)



(c)



0-3 (a) $\int_{-\infty}^{\infty} e^{t}\delta(t-2)\,dt = e^{t}\big|_{t=2} = e^{2}$

(b) $\int_{-\infty}^{\infty} (t+\sin t)\delta(t+\frac{\pi}{3})\,dt = (t+\sin t)\big|_{t=-\frac{\pi}{3}} = -1.91$

(c) $\int_{-\infty}^{\infty} \delta(t-t_0)\varepsilon(t-2t_0)\,dt = \varepsilon(t-2t_0)\big|_{t=t_0} = 0 \quad (t_0>0)$

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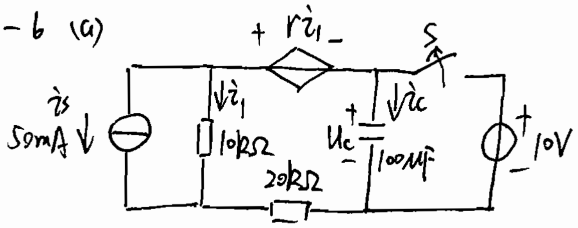
10-6 (a)

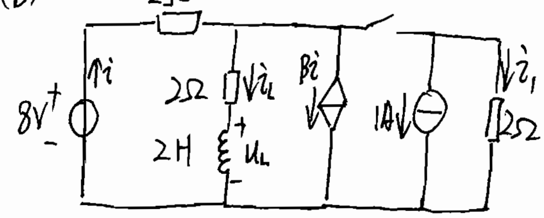


$U_c(0^+) = 10V$

0^+时刻 $\begin{cases} i_1 + i_c = -i_s \\ \cancel{10i_1} \\ 10k\cdot i_1 = ri_1 + U_c + 20k\cdot i_c \end{cases}$

$\therefore i_c(0^+) = -16.9mA \quad i_1(0^+) = -33.1mA$

(b)



0^-时刻 $\begin{cases} i = i_L + \beta i \\ 8V = 2\Omega\cdot i + 2\Omega\cdot i_L \end{cases}$

$\therefore i_L(0^-) = 6A$

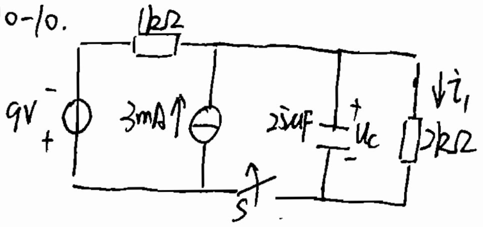
0^+时刻 $i_L(0^+) = i_L(0^-) = 6A$

$\begin{cases} i = i_L + \beta i + 1A + i_1 \\ 8V = 2\Omega\cdot i + 2\Omega\cdot i_1 \end{cases}$

$\therefore i(0^+) = -5.5A \quad i_1(0^+) = 9.5A$

$\because u_L + i_L\cdot 2\Omega = i_1\cdot 2\Omega \quad \therefore u_L(0^+) = 7V$

10-10.



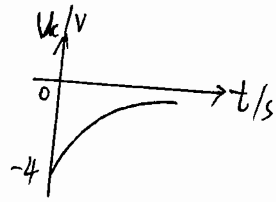
0^-时刻 $9V + 2k\Omega\cdot i_1 + 1k\Omega\cdot(3mA + i_1) = 0$

$\therefore i_1 = -2mA \quad \therefore U_c = 2k\Omega\cdot i_1 = -4V. \quad U_c(0^-) = U_c(0^+)$

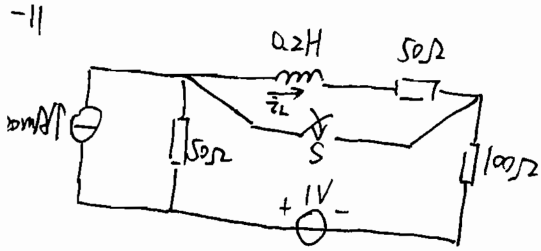
∞时刻 $U_c = 0$

$\tau = 25\mu F\cdot 2k\Omega = 0.05s$

$\therefore U_c(t) = -4e^{-\frac{t}{0.05}}V = -4e^{-20t}V.$



-11



0^-时刻 $(20mA - i_L)\cdot 50\Omega = i_L(50\Omega + 100\Omega) - 1V$

$\therefore i_L = 10mA \quad i_L(0^-) = i_L(0^+)$

∞时刻 $i_L = 0$

$\tau = \frac{L}{R} = \frac{0.2H}{50\Omega} = 0.004s$

$\therefore \cancel{甘}\ i_L(t) = 10e^{-\frac{t}{0.004}}mA = 10e^{-250t}mA$