10-6.

(1). 打开时.

$Z = R_1 + R_2 + j\omega(L_1 + L_2 + 2M)$

$= 2 + 8j\ \Omega$

$\dot{U}_1 = 100\angle 0°$

$\dot{I}_1 = 10.846\angle -77.47°\ A$

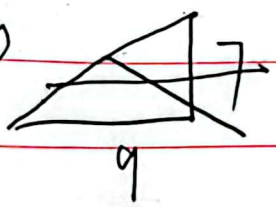
闭合时

$$\begin{cases} (R_1 + j\omega L_1)\dot{I}_1 + j\omega M \dot{I}_2 = \dot{U}_1 \\ j\omega M \dot{I}_1 + (j\omega L_2 + R_2)\dot{I}_2 = 0 \end{cases}$$

$\dot{I}_1 = 43.85\angle -37.87°$

(2). $\bar{S}_1 = \dot{U}_1 \dot{I}_1 = 100 \times 43.85\angle -37.87° = (3461.5 + j2691.8)\ V\cdot A$

$\bar{S}_2 = \dot{U}_2 \dot{I}_2 = 0$



10-11: $\dot{I}_1 j\omega M + \dot{I}_2 j\omega L_2 = 0$

$$\dot{I}_1 = \frac{-j\omega\frac{1}{C} + j\omega(L_2 - M)}{-2j\omega\frac{1}{C} + j\omega(L_1 + L_2 - 2M)} \cdot \dot{I}$$

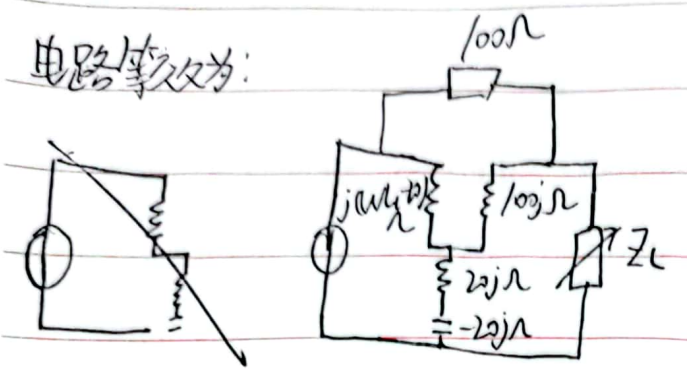
$$\dot{I}_2 = \frac{-j\omega\frac{1}{C} + j\omega(L_1 - M)}{-2j\omega\frac{1}{C} + j\omega(L_1 + L_2 - 2M)} \cdot \dot{I}$$

由解得: $\omega = \sqrt{\frac{M + L_2}{C(L_1 L_2 - M^2)}}$

且显然, 当 $\omega = 0$ 时, 电容相当于断路,

10-16.

电路等效为:



则从ZL看出的戴维宁等效电路为

$Z_{eq} = 100j // 100 \Omega = 50 + 50j$

$U_{oc} = 100 \angle 0° \times \frac{100j}{100 + 100j} = 50 + 50j = 50\sqrt{2} \angle 45°$

∴ 当 $Z_L = (50 - j50)\Omega$ 时, $P_{max} = \frac{(50\sqrt{2})^2}{4 \times 50} = 25W$.

17. 设10Ω电阻电端电压为U, 易知, 当有 U_{max} 有 P_{max}

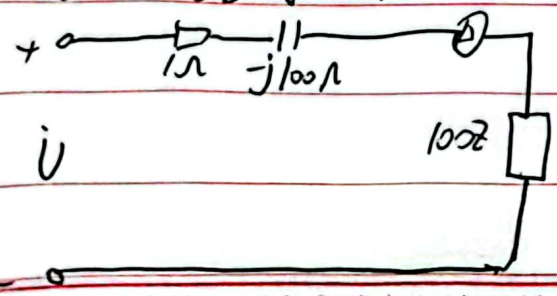
$\therefore \frac{nU}{50} + \frac{U}{10n} = i_S$

$U\left(\frac{n}{50} + \frac{1}{10n}\right) = i_S$

∴ 当 $\frac{n}{50} = \frac{1}{10n}$ 时

$n = \sqrt{5}$ 时, 有 U_{max}, P_{max}

18. 电路等效为



$\because |\dot{I}| = \frac{U}{I} = 1\Omega$

$|\dot{U}| = |1 - j100 + 100Z| = 1$

解得 $Z = j1\Omega$

11-7: 发生谐振时

$\omega_0 = \sqrt{\frac{1}{LC}} = 1.4142 \times 10^7 \text{ rad/s}$

$f_0 = \frac{\omega_0}{2\pi} = 2.252 \times 10^6 \text{ Hz} = 2.252 \text{ MHz}$.

$U_c = QU_s = 70.71 \text{ mV}$

$BW = \frac{\omega_0}{Q} = 2 \times 10^5 \text{ rad/s}$

11-12.

当电路谐振时

$\omega_0 L = \frac{1}{\omega_0 C}$

$\omega_0 = \sqrt{\frac{1}{LC}} = 5 \times 10^6 \text{ rad/s}$

$\omega_0 L = 500\Omega$

$R_e = \frac{(\omega_0 L)^2}{R} = 25000\Omega = 25k\Omega$

$Q = \frac{\omega_0 L}{R} = 50$

$BW = \frac{\omega_0}{Q} = 10^5 \text{ rad/s}$

当 $R_L = R_0 = 250k\Omega$ 时

有 $P_{max} = \frac{1}{2} I_0^2 R_L = 2.5W$

13-8.

易知，当 $\omega = \omega_1$，$\omega L_1 = \frac{1}{\omega C} \Rightarrow L_1 = \frac{1}{\omega_1^2 C} = 1 H$

当发生 $\omega = 4\omega_1$

$\omega L_1 // \frac{1}{\omega C} + \omega L_2 = 0$

解得，$L_2 = 66.67 mH$

13-9.

①: 若 $3W_1L=\frac{1}{3W_1\cdot 1}$, $7W_1\cdot 1=\frac{1}{7W_1C}$ $\Rightarrow L=\frac{1}{9W_1^2}$, $C=\frac{1}{49W_1^2}$

②: 若 $7W_1L=\frac{1}{7W_1\cdot 1}$, $3W_1\cdot 1=\frac{1}{3W_1C}$ $\Rightarrow L=\frac{1}{49W_1^2}$, $C=\frac{1}{9W_1^2}$

$\therefore L=\frac{1}{9W_1^2}$, $C=\frac{1}{49W_1^2}$ 或 $L=\frac{1}{49W_1^2}$, $C=\frac{1}{9W_1^2}$

13-11: 受控电流源可等效为2Ω电阻 $U_1=5$

只考虑Us直流部分:

(1) $1.5=3U_{R1}$, $U_{R1}=0.5V$, $I_1=0.5A$, $P_{US1}=U_S I_1=0.75W$

$P_1=\frac{U_{R1}^2}{R_1}=0.25W$

交流部分: $U=5\angle 0°$, $U_{R2}=U\cdot\frac{2X2j}{3+2X2j}=1\angle -53.13°$, $I=1\angle -53.13A$

~~$P_2=\frac{5}{|3+j2X4|}\times 1=1W$~~ $P_{US2}=5\times 1\times\cos(0+53.13°)=3W$

电流源作用:

流经4R的电流 $I_3=\frac{j2X1.5}{3+j2X1.5}\times N\angle\frac{1}{2}=1A$

$P_3=I_3^2\cdot R=1W$

$P_R=P_1+P_2+P_3=2.25W$

$I_R=\frac{j3}{3+j3}\times N\sqrt{2}\angle -90°=1\angle -45°$, $U_R=1\angle -45°$

$\therefore U_R=U_{R1}+U_{R2}+U_{R3}=0.5+N\sqrt{2}\cos(2t-53.13°)+N\sqrt{2}\cos(1.5t-45°)$

$P_{US}=0.75+3=3.75W$