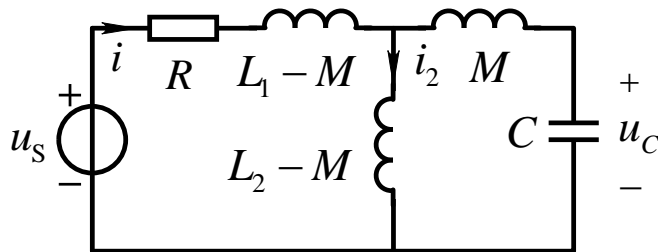
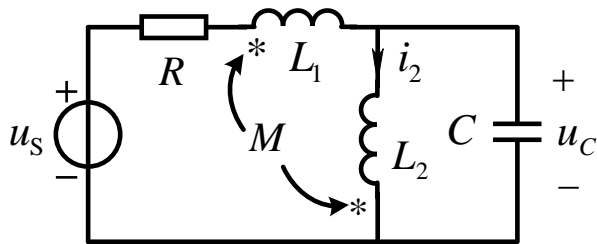


谐振电路-例题

例2 图示非正弦电路 $u_s = [80 + 60\sqrt{2} \cos(\omega t) + 80\sqrt{2} \cos(2\omega t)]V$,
 $R = 80\Omega$, $\omega L_1 = 60\Omega$, $\omega L_2 = 80\Omega$, $\omega M = 20\Omega$, $1/(\omega C) = 80\Omega$, 求电压 u_C 和电流 i_2 的瞬时值以及电压源发出的平均功率。



解：当直流 $U_{S(0)} = 80V$ 单独作用时，电感短路，电容开路。

$$I_{(0)} = I_{2(0)} = \frac{U_{S(0)}}{R} = \frac{80}{80} = 1A$$

$$U_{C(0)} = 0$$

$$P_{(0)} = I_{(0)}^2 R = 80W$$

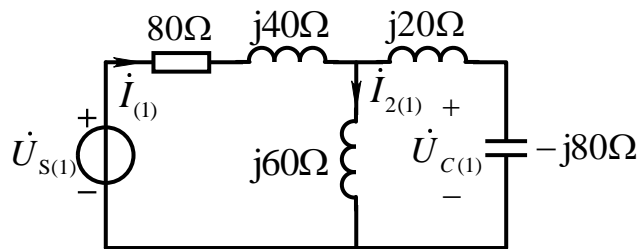
谐振电路-例题

$$u_s = [80 + 60\sqrt{2} \cos(\omega t) + 80\sqrt{2} \cos(2\omega t)]V \quad R = 80\Omega$$

$$\omega L_1 = 60\Omega, \quad \omega L_2 = 80\Omega, \quad \omega M = 20\Omega, \quad 1/(\omega C) = 80\Omega$$

解：当基波单独作用时

$$\dot{U}_{s(1)} = 60\angle 0^\circ V$$



等效电路并联部分谐振，相当于开路

$$\dot{i}_{2(1)} = \frac{\dot{U}_{s(1)}}{j60} = \frac{60\angle 0^\circ}{j60} = 1\angle -90^\circ A$$

$$P_{(1)} = I_{(1)}^2 R = 0$$

$$\dot{U}_{C(1)} = \frac{-j80}{j20 - j80} \times 60\angle 0^\circ = 80\angle 0^\circ V$$

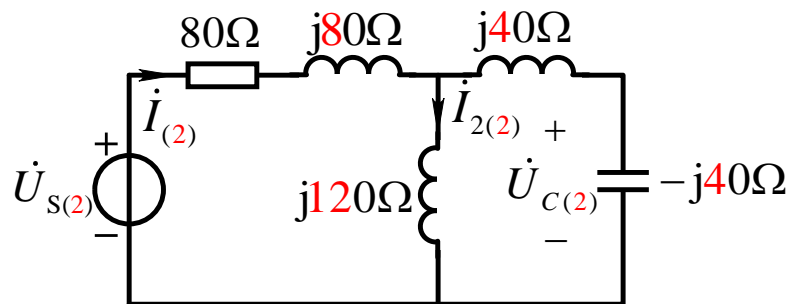
谐振电路-例题

$$u_s = [80 + 60\sqrt{2} \cos(\omega t) + 80\sqrt{2} \cos(2\omega t)]V \quad R = 80\Omega$$

$$\omega L_1 = 60\Omega, \quad \omega L_2 = 80\Omega, \quad \omega M = 20\Omega, \quad 1/(\omega C) = 80\Omega$$

解：当二次谐波作用时 $\dot{U}_{s(2)} = 80\angle 0^\circ V$

等效电路中互感和电容串联谐振，
相当于短路



$$\dot{I}_{2(2)} = 0 \quad \dot{I}_{(2)} = \frac{80\angle 0^\circ}{80 + j80} = \frac{\sqrt{2}}{2} \angle -45^\circ A$$

$$\dot{U}_{c(2)} = \dot{I}_{(2)} \times (-j40) = 0.5\sqrt{2} \angle -45^\circ \times (-j40) = 20\sqrt{2} \angle -135^\circ V \quad P_{(2)} = I_{(2)}^2 R = 40W$$

电压 $u_c = [80\sqrt{2} \cos \omega t + 40 \cos(2\omega t - 135^\circ)]V$

电流 $i_2 = [1 + \sqrt{2} \cos(\omega t - 90^\circ)]A$

功率 $P = 80 + 40 = 120W$