

Electrical Power Engineering Fundamentals

Departamento de Ingeniería Eléctrica. Universidad Carlos III de Madrid

Module 3. Analysis of AC Circuits. Week 7.

Exercise 1. In the circuit below, find $u_1(t)$, $u_2(t)$ and check the power balance:

$$U_g(t) = 180\sqrt{2}\cos(1000t) \text{ V}$$

$$I_g(t) = 12\sqrt{2}\cos(1000t) \text{ A}$$

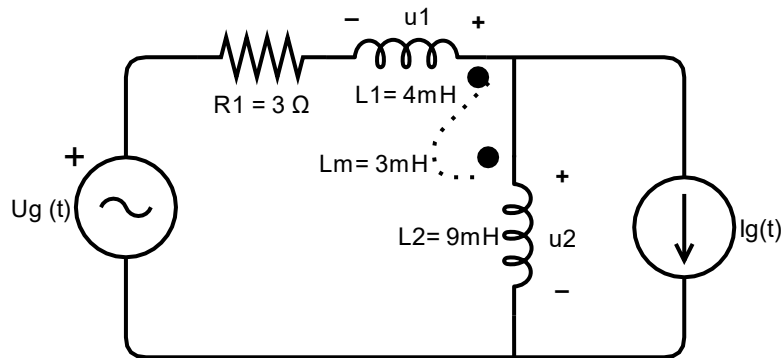


Figure 1 AC circuit 1

Solution: $e_1(t) = 80.5\cos(1000t - 108.435^\circ) \text{ V}$; $e_2(t) = 108\sqrt{2}\cos(1000t) \text{ V}$; $P_{R1} = 1944\text{W}$; $S_{L1} = -648 + 1296j \text{ VA}$; $S_{L2} = 648 + 1944j \text{ VA}$; $S_{I_g} = -1296 + 0j \text{ VA}$; $S_{U_g} = 3240 + 3240j \text{ VA}$;

Exercise 2. In the circuit below, find $u_1(t)$, $u_2(t)$ and $U_{ig}(t)$:

$$U_g(t) = \sqrt{2}\cos(2t + 180^\circ) \text{ V}$$

$$I_g(t) = 2\sqrt{2}\sin(2t) \text{ A}$$

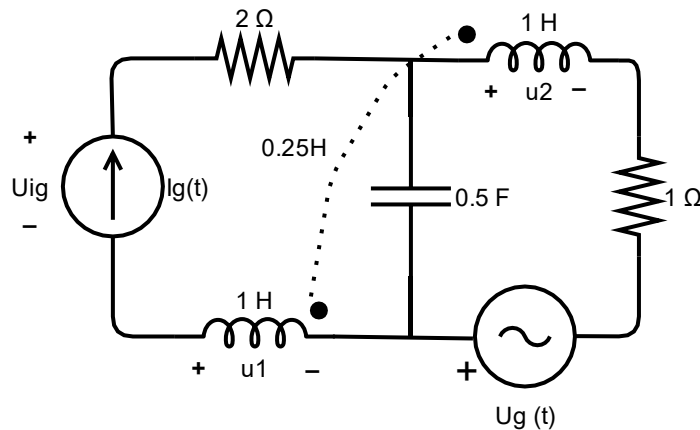


Figure 2 AC circuit 2

Solution: $u_1(t) = 4.47\sin(2t - 108.4^\circ) \text{ V}$; $u_2(t) = 7.07\sin(2t - 36.87^\circ) \text{ V}$; $U_{ig}(t) = 10\sin(2t - 8.13^\circ) \text{ V}$;

Exercise 3. In the circuit below:

- Find the Thevenin equivalent between nodes A-B
- Calculate the current $i(t)$.

$$U_g(t) = \sqrt{2} \sin(1000t) \text{ V}$$

$$I_g(t) = \sqrt{2} \cos(1000t) \text{ A}$$

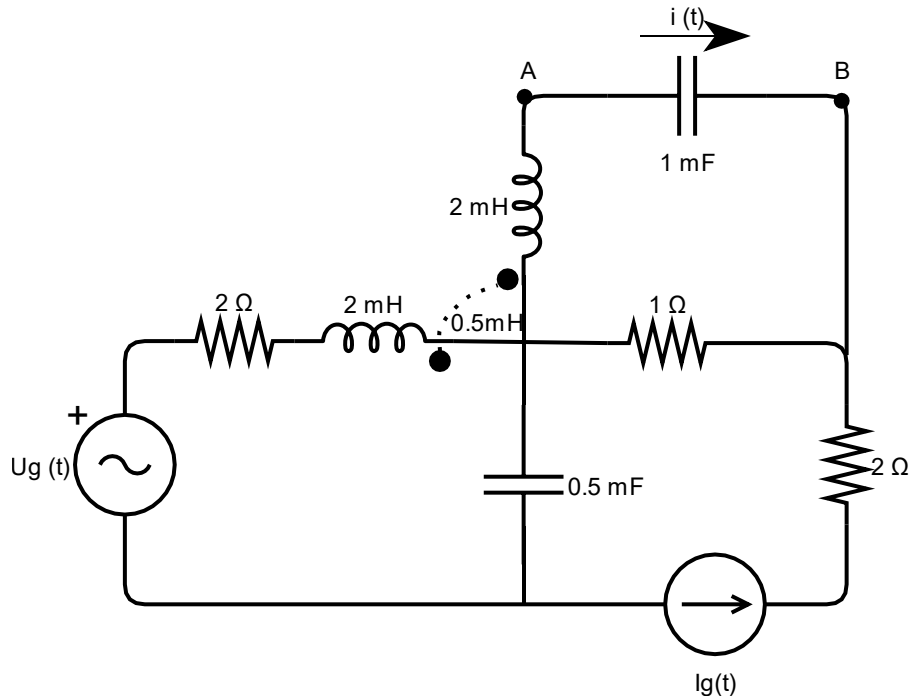


Figure 3. AC circuit 3

$$U_{TH}(t) = 1.25\sqrt{2}\sin(1000t-90^\circ) \text{ V}; Z_{TH} = 1.125+2j \Omega; i(t) = 1.174\sin(1000t-131.63^\circ) \text{ A}$$