Electrical Power Engineering Fundamentals

Departamento de Ingeniería Eléctrica. Universidad Carlos III de Madrid

Module 3. Analysis of AC Circuits. Week 6

Exercise 1. In the circuit below, find current i(t) using Thevenin's Theorem:

Ug1(t) =$2\sqrt{2}$cos (2t) V
Ig2 (t) =2sin (2t + 45º) A
Ug3(t) =$3\sqrt{2}$sin (2t) V

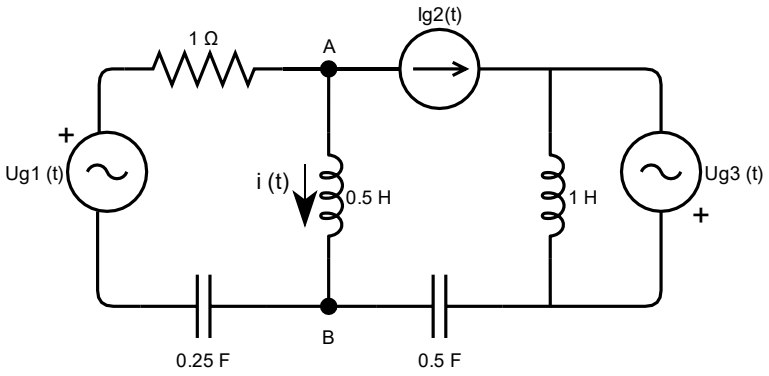

Figure 1 AC circuit 1

Solution: i(t) = $3\sqrt{2}$ sin(2t + 180º) A; U_{TH} (t) = 6 sin(2t + 135º) V; Z_{TH} =1 – 2j Ω

Exercise 2. In the circuit below, find the power generated by sources and check the power balance:

Ug (t) =$5\sqrt{2}$sin (2t) V
Ig1 (t)=20sin (2 t - 45º) A
Ig2 (t)=$2\sqrt{2}$cos (2t) A

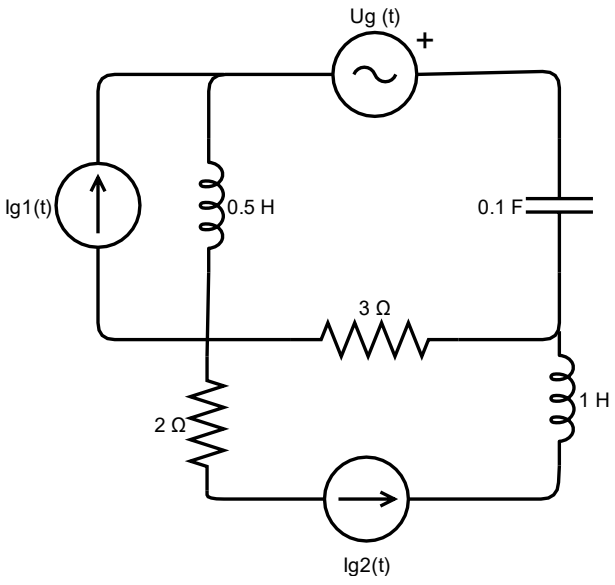

Figure 2 AC circuit 2

Solution: S_{Ug} = 5.8 -14.4j VA; S_{Ig1} = 40.4+217.2j VA; S_{Ig2} = 37.28+1.04j VA; $S_{consumed\_by\_loads}$ = $S_{generated\_by\_sources}$ = 83.48 +203.84j VA

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Exercise 3. In the following circuit, find i(t) and check the power balance:

Ug1(t) =$5\sqrt{2}$sin (0.5t) V
Ug2(t) =$2\sqrt{2}$cos (0.5t) V
Ug3(t) =$\sqrt{2}$sin (0.5t-90º) V

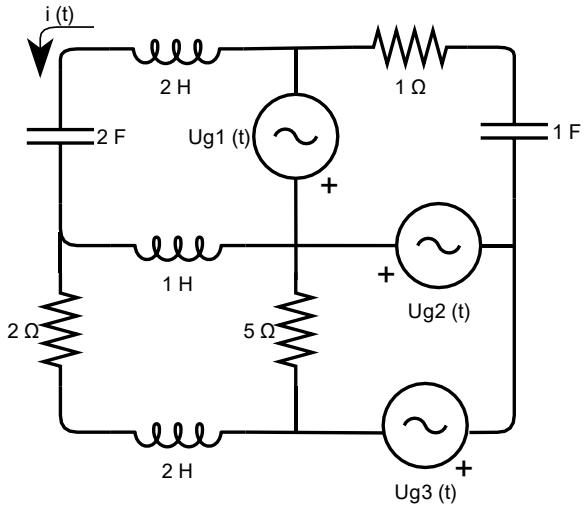

Figure 3. AC circuit 3

Solution: i(t)=16.32cos(0.5t+8.97º) A; $S_{consumed\_by\_loads} = S_{generated\_by\_sources}$ = 16.4+43.6j VA

Exercise 4. Find the Thévenin equivalent between nodes A and B for the following circuit.

Ug(t) =$\sqrt{2}$sin (2t+180º) V
Ig (t) =$\sqrt{2}$cos (2t) A

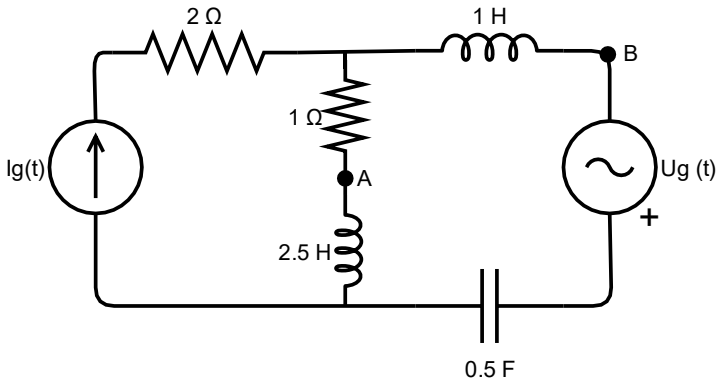

Figure 4. AC circuit 4

Solution: $U_{TH}(t)$ = $2\sqrt{2}$sin(2t+180º) V; Z_{TH} =16/37+52/37j **Ω**; $I_{SC}(t)$ = $1.36\sqrt{2}$ sin (2t + 107º) A;

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