Electrical Power Engineering Fundamentals

Departamento de Ingeniería Eléctrica. Universidad Carlos III de Madrid

Module 4. Three-phase AC Systems. Week 10

Exercise 1. The following circuit shows a balanced three-phase load connected to an ideal balanced three-phase voltage source. (A, B, C) is a direct sequence. Find the current i and the power consumed by the load.

$U_{BC}=400\angle 30^{o}$ V

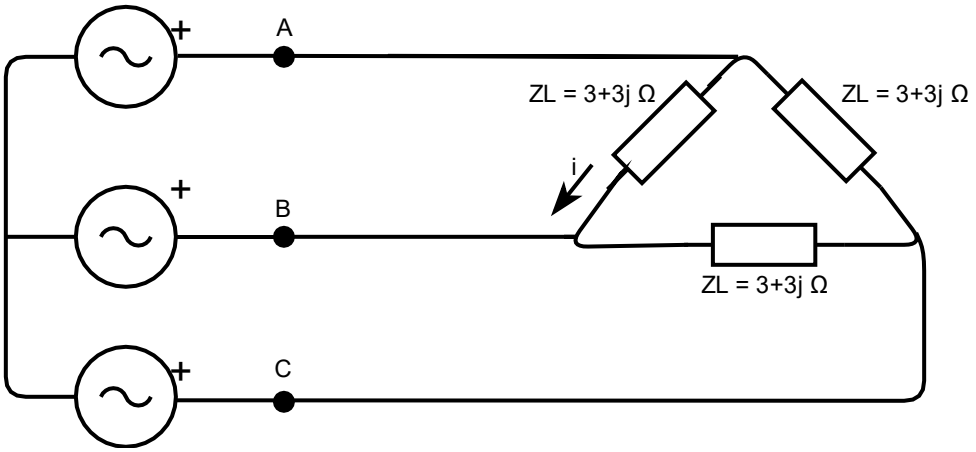

Figure 1 Three-phase AC system 1

Solution: $i=94.28\angle 105^{o}$ A; $S_L=80000+80000j$ VA

Exercise 2. The following circuit shows 2 balanced three-phase loads connected to an ideal balanced three-phase voltage source. (A, B, C) is a direct sequence. Find: a) the current I_B; b) the power consumed by load 2; c) the power generated by the three-phase voltage source.

$U_{AB} = 400\angle 0^{o}$ V

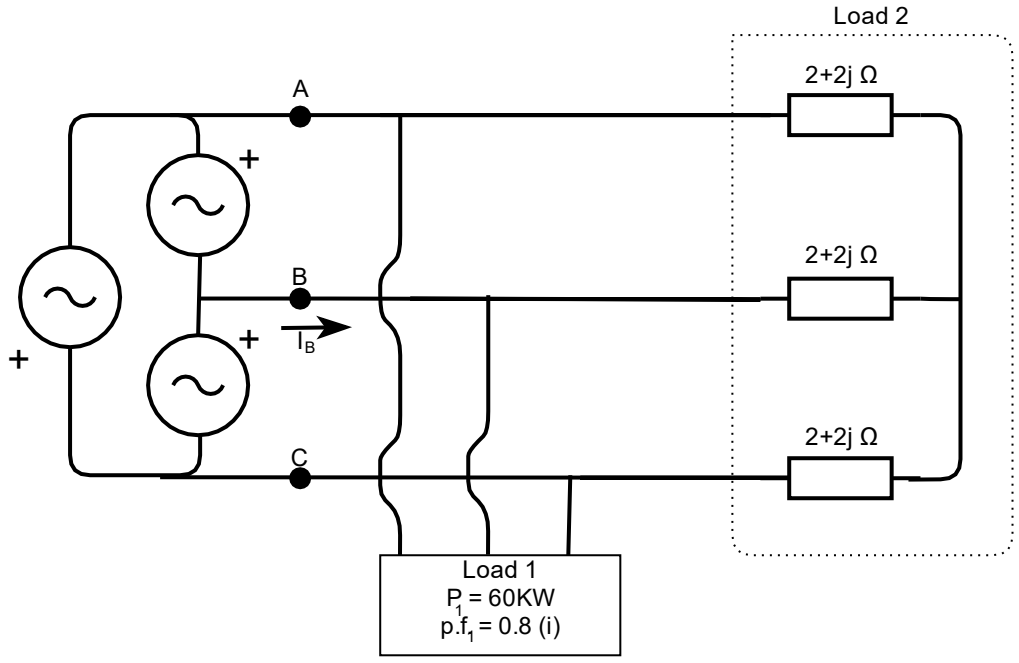

Figure 2. Three-phase AC system 2

Solution: $I_B= 189.4\angle -190^{o}$ A; $S_{L2} = 40000+40000j$ VA; $S_{3VS} = 100000+85000j$ VA

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Exercise 3. The following figure shows a balanced three-phase AC system. (A, B, C) is a direct sequence. Find the impedance $Z_{L1,}$ knowing that the voltage $U_{CA} = 400\angle -210^{o}$ V and the total power generated by the balanced three-phase voltage source $S_{3VS} = 60000+40000j$ VA.

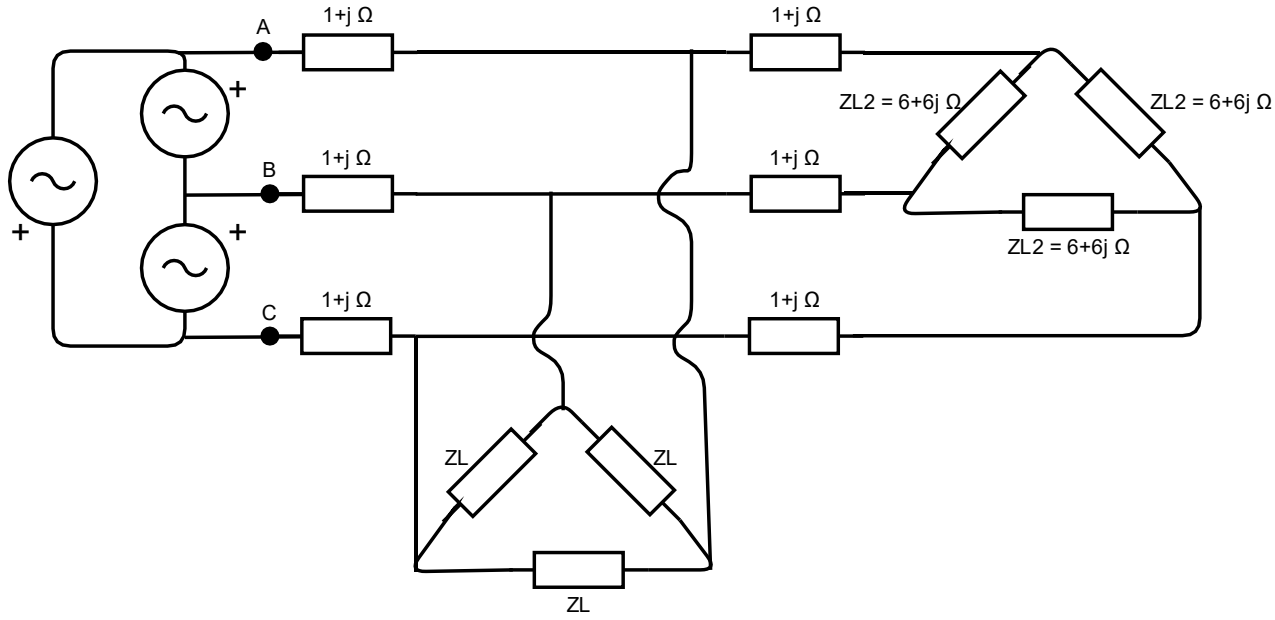

Figure 3. Three-phase AC system 3

Solution: $Z_L = 3.15 + 0.45j\ \Omega$

Exercise 4. The following circuit shows 3 balanced three-phase loads connected to an ideal balanced three-phase voltage source. In the circuit, the load 3 is composed of 3 capacitors of 1 mF each that can be connected in Y or in Δ. Choose the connection to minimize the current I_B. Justify the choice.

$U_{AB} = 400\angle 0^{o}$
f = 50Hz

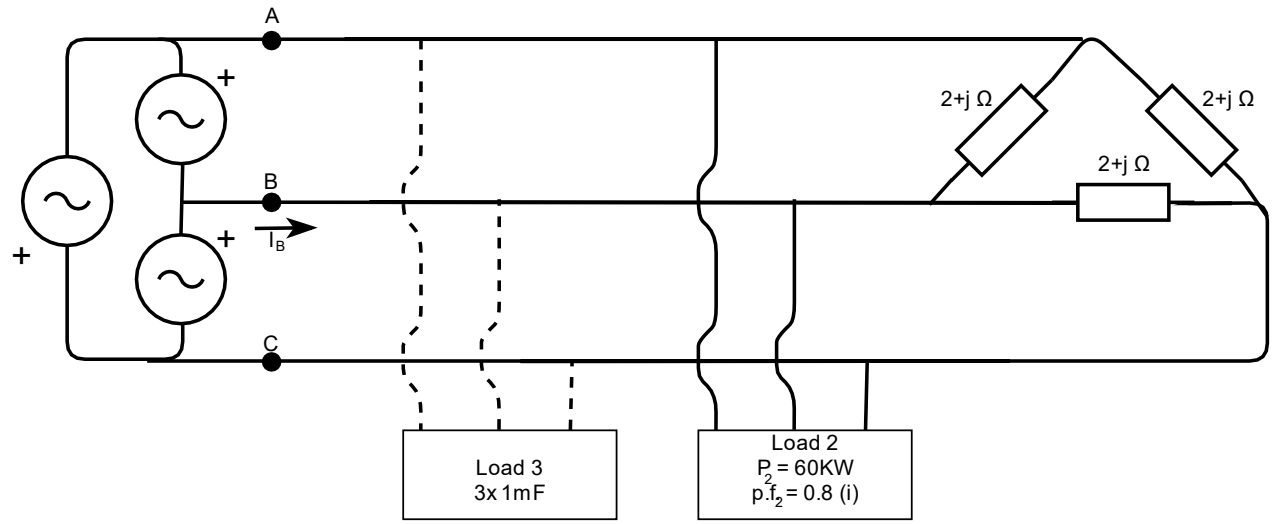

Figure 4 Three-phase AC system 4

Solution: Δ. $Q_T = -9796.44$var

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