Homework-II
Due: 29.04.2019

P 12.5-1 Consider a three-wire Y-to-Δ circuit. The voltages of the Y-connected source are $\mathbf{V}_a = (208/\sqrt{3})\angle{-30^\circ}$ V rms, $\mathbf{V}_b = (208/\sqrt{3})\angle{-150^\circ}$ V rms, and $\mathbf{V}_c = (208/\sqrt{3})\angle{90^\circ}$ V rms. The Δ-connected load is balanced. The impedance of each phase is $\mathbf{Z} = 12\angle{30^\circ}\ \Omega$. Determine the line currents and calculate the power dissipated in the load.

P 12.5-3 The balanced circuit shown in Figure P 12.5-3 has $\mathbf{V}_{ab} = 380\angle{30^\circ}$ V rms. Determine the phase currents in the load when $\mathbf{Z} = 3 + j4\ \Omega$. Sketch a phasor diagram.

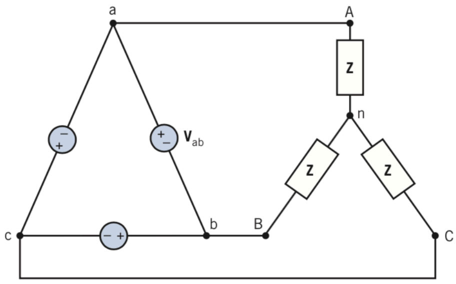

Figure P 12.5-3 A Δ-to-Y circuit.

P 12.7-2 A three-phase motor delivers 20 hp operating from a 480-V rms line voltage. The motor operates at 85 percent efficiency with a power factor equal to 0.8 lagging. Find the magnitude and angle of the line current for phase A.

Hint: 1 hp = 745.7 W

P 12.7-6 A building is supplied by a public utility at 4.16 kV rms. The building contains three balanced loads connected to the three-phase lines:

(a) Δ connected, 500 kVA at 0.85 lagging
(b) Y connected, 75 kVA at 0.0 leading
(c) Y connected; each phase with a 150-Ω resistor parallel to a 225-Ω inductive reactance

The utility feeder is five miles long with an impedance per phase of $1.69 + j0.78$ Ω/mile. At what voltage must the utility supply its feeder so that the building is operating at 4.16 kV rms?

Hint: 41.6 kV is the line-to-line voltage of the balanced Y-connected source.

P 12.7-8 The balanced three-phase load of a large commercial building requires 480 kW at a lagging power factor of 0.8. The load is supplied by a connecting line with an impedance of $5 + j25$ mΩ for each phase. Each phase of the load has a line-to-line voltage of 600 V rms. Determine the line current and the line voltage at the source. Also, determine the power factor at the source. Use the line-to-neutral voltage as the reference with an angle of 0°.

P 11.9-17 Determine the complex power supplied by the source in the circuit shown in Figure P 11.9-17.

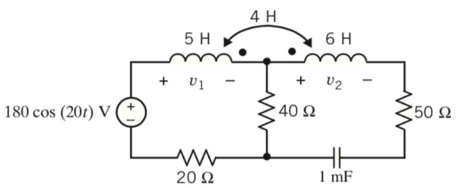

Figure P 11.9-17

P 11.11-3 Computer analysis of the circuit shown in Figure P 11.11-3 indicates that when

$$v_s(t) = 12\cos(4t + 30^\circ)\ \text{V}$$

the mesh currents are given by

$$i_1(t) = 1.001\cos(4t - 47.01^\circ)\ \text{A}$$

and

$$i_2(t) = 0.4243\cos(4t - 15.00^\circ)\ \text{A}$$

Check the results of this analysis by checking that the equations describing currents and voltages of coupled coils are satisfied.

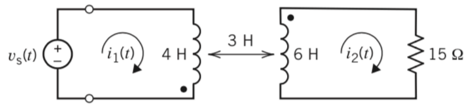

Figure P 11.11-3

P 14.8-15 A circuit is described by the transfer function

$$\frac{V_o}{V_1} = H(s) = \frac{9s + 18}{3s^3 + 18s^2 + 39s}$$

Find the step response and impulse response of the circuit.

P 14.8-23 The input to the circuit shown in Figure P 14.8-23 is the voltage of the voltage source $v_i(t)$, and the output is the voltage $v_o(t)$. Determine the step response of the circuit.

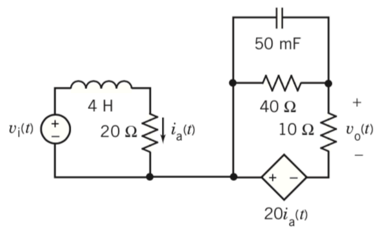

Figure P 14.8-23