C12 problems

Practice Problem 12.1

Given that $\mathbf{V}_{bn} = 110\underline{/30^\circ}$ V, find $\mathbf{V}_{an}$ and $\mathbf{V}_{cn}$, assuming a positive (abc) sequence.

Answer: $110\underline{/150^\circ}$ V, $110\underline{/-90^\circ}$ V.

Practice Problem 12.4

A positive-sequence, balanced Δ-connected source supplies a balanced Δ-connected load. If the impedance per phase of the load is $18 + j12\ \Omega$ and $\mathbf{I}_a = 9.609\underline{/35^\circ}$ A, find $\mathbf{I}_{AB}$ and $\mathbf{V}_{AB}$.

Answer: $5.548\underline{/65^\circ}$ A, $120\underline{/98.69^\circ}$ V.

Practice Problem 12.5

In a balanced Δ-Y circuit, $\mathbf{V}_{ab} = 240\angle 15^\circ$ and $\mathbf{Z}_Y = (12 + j15)\ \Omega$. Calculate the line currents.

Answer: $7.21\angle -66.34^\circ$ A, $7.21\angle +173.66^\circ$ A, $7.21\angle 53.66^\circ$ A.

Practice Problem 12.7

Calculate the line current required for a 30-kW three-phase motor having a power factor of 0.85 lagging if it is connected to a balanced source with a line voltage of 440 V.

Answer: 46.31 A.

Practice Problem 12.9

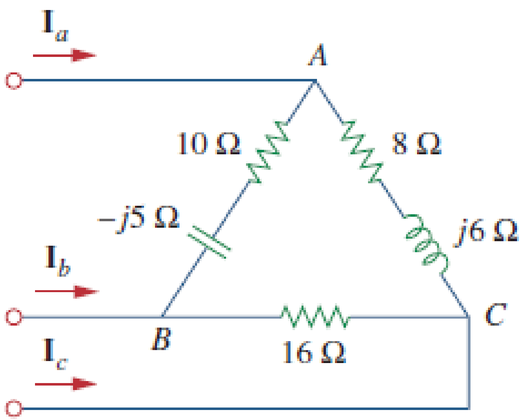

Figure 12.24
Unbalanced Δ-load; for Practice Prob. 12.9.

The unbalanced Δ-load of Fig. 12.24 is supplied by balanced line-to-line voltages of 440 V in the positive sequence. Find the line currents. Take $\mathbf{V}_{ab}$ as reference.

Answer: $39.71\angle{-41.06^\circ}$ A, $64.12\angle{-139.8^\circ}$ A, $70.13\angle{74.27^\circ}$ A.

Practice Problem 12.15

If the load in Fig. 12.35 is delta-connected with impedance per phase of $\mathbf{Z}_p = 30 - j40\ \Omega$ and $V_L = 440$ V, predict the readings of the wattmeters W_1 and W_2. Calculate P_T and Q_T.

Answer: 6.167 kW, 0.8021 kW, 6.969 kW, −9.292 kVAR.

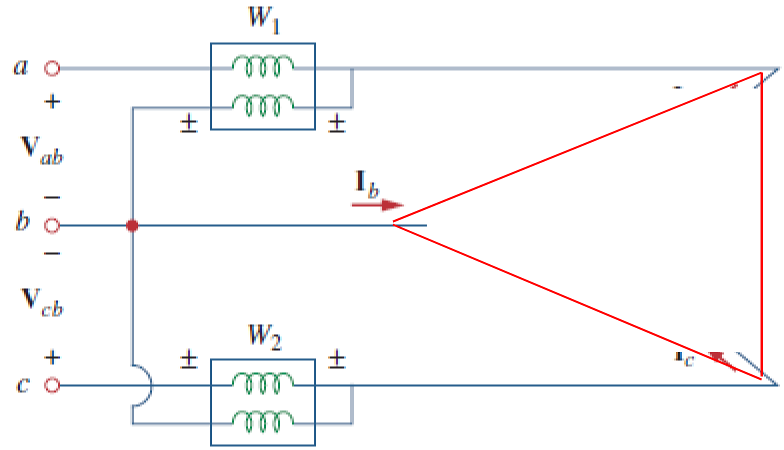

Figure 12.35
Two-wattmeter method applied to a balanced wye load.

- 12.1 (s12.2)
- 12.4 (s12.5)
- 12.5 (s12.6)
- 12.7 (s12.7)
- 12.9 (s12.8)
- 12.15 (s12.10)