Tutorial 6

Q.1.

Each impedance $\mathbf{Z}_p$ in the balanced three-phase system of Fig. 12.34 is constructed using the parallel combination of a 1 mF capacitance, a 100 mH inductance, and a 10 Ω resistance. The sources have positive phase sequence and operate at 50 Hz. If $\mathbf{V}_{ab} = 208\underline{/0^\circ}$ V, and $R_w = 0$, calculate (*a*) all phase voltages; (*b*) all line voltages; (*c*) all three line currents; (*d*) the total power drawn by the load.

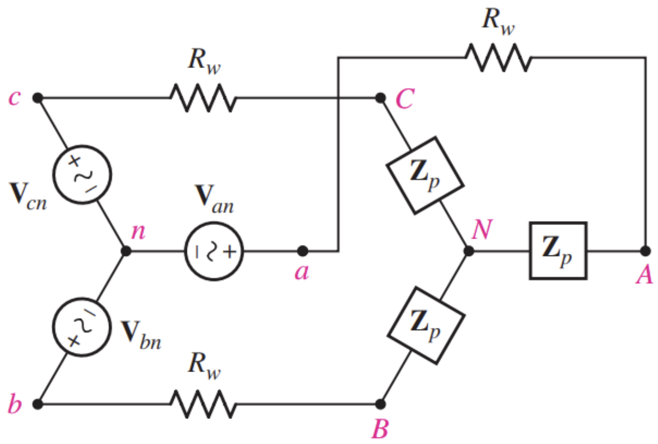

FIGURE 12.34

Q.2.

The balanced three-phase system of Fig. 12.34 is characterized by a positive phase sequence and a line voltage of 300 V. And $\mathbf{Z}_p$ is given by the parallel combination of a $5 - j3$ Ω capacitive load and a $9 + j2$ Ω inductive load. If $R_w = 0$, calculate (*a*) the power factor of the source; (*b*) the total power supplied by the source. (*c*) Repeat parts (*a*) and (*b*) if $R_w = 1$ Ω.

Q.3.

A three-phase load is to be powered by a three-wire three-phase Y-connected source having phase voltage of 400 V and operating at 50 Hz. Each phase of the load consists of a parallel combination of a 500 Ω resistor, 10 mH inductor, and 1 mF capacitor. (*a*) Compute the line current, line voltage, phase current, and power factor of the load if the load is also Y-connected. (*b*) Rewire the load so that it is Δ-connected and find the same quantities requested in part (*a*).

Q.4.

Two Δ-connected loads are connected in parallel and powered by a balanced Y-connected system. The smaller of the two loads draws 10 kVA at a lagging PF of 0.75, and the larger draws 25 kVA at a leading PF of 0.80. The line voltage is 400 V. Calculate (*a*) the power factor at which the source is operating; (*b*) the total power drawn by the two loads; (*c*) the phase current of each load.