

ECE 330 HW 2

In class quiz – Wed, Feb 5.

Copies of the textbook are kept at the Grainger Engineering Library Reserve

Textbook problem 2.11 (Answer: $\bar{S} = 588 + j181.5$ kVA, pf=0.955 lagging, $Q_{cap}=-622.5$ kVAR)

Textbook problem 2.17 (Assume Wye-connected loads and sources. (d) Answer: 73.61A)

Textbook problem 2.18

Textbook problem 2.20 (Answer: $\bar{I}_a = 120\angle -30^\circ$ A, $\bar{I}_b = 120\angle -150^\circ$ A, $\bar{I}_c = 120\angle 90^\circ$ A, $\bar{V}_{an} = 2532\angle 2.88^\circ$ V, $\bar{V}_{bn} = 2532\angle -117.12^\circ$ V, $\bar{V}_{cn} = 2532\angle 122.88^\circ$ V, $\bar{V}_{ab} = 4386\angle 32.88^\circ$ V, $\bar{V}_{bc} = 4386\angle -87.12^\circ$ V, $\bar{V}_{ca} = 4386\angle 152.88^\circ$ V, $\bar{S}_{3\phi} = 749 + j432$ kVA, $\bar{S}_{3gen} = 766 + j496$ kVA)

Textbook problem 2.25

Special Problem #1

A balanced, 3-phase, 3-wire, 60Hz, Wye-connected source is serving a combination of balanced loads in various configurations. Measurement of the source line voltage indicates 480 Volts (line to line). Measurement of the source line current indicates 23 Amps. When 8 kVAR of capacitance (3-phase) is added in parallel to the other loads, the source voltage stays the same and the source line current changes to 18 Amps.

What is the total 3-phase original load in Watts and Vars? (Answer: $\bar{S} = 14153 + j12856$ VA)

Special Problem #2

The following three-phase, balanced loads are connected across a three-phase, wye-connected source (60Hz and 480V - line to line). The nature of the three loads are described below:

Load #1: Wye-connected load with 100kVA (3-phase) at 0.9 PF lag;

Load #2: Wye-connected load with 60kW (3-phase) at 0.7 PF lead.

Load #3: Wye-connected load, with 75 A phase current and 0.6 PF lag.

Calculate the following:

1. The total complex power (3-phase) consumed by these three loads. (Answer: $\bar{S} = 206 - j3.66$ kVA)
2. The magnitude of the total source line current (answer: 228.74 A).
3. The capacitive reactive power **per phase** needed to be added to the Wye-connected loads to make the overall PF equal to 1.0 (total for all loads, Answer: -10.75 kVAR).
4. The magnitude of the total source line current after the power factor correction of part 3 (Answer: 225.42 A).