KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

ELECTRICAL ENGINEERING DEPARTMENT

EE 306 – Term 171

HW # 1: Three-Phase Circuits

Due Date: October 2nd, 2017

Problem # 1:

Three impedances of $4 + j3\ \Omega$ are Δ-connected and tied to a three-phase 208-V power line. Find I_ϕ, I_L, P, Q, S, and the power factor of this load.

Problem # 2:

Prove that the line voltage of a Y-connected generator with an *acb* phase sequence lags the corresponding phase voltage by 30°. Draw a phasor diagram showing the phase and line voltages for this generator.

Problem # 3:

A balanced 3-phase, 173-V, 60-Hz source supplies the two following loads:

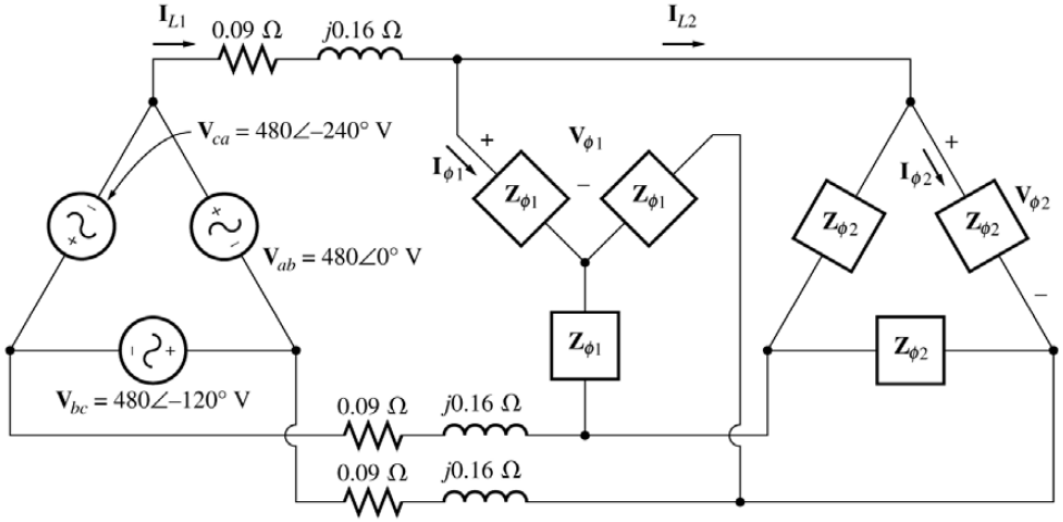
- A Δ-connected load with a phase impedance of $(18+j24)\ \Omega$,
- A Y-connected load with a phase impedance of $10\angle 53.13°\ \Omega$.

Find:

a. The power factor of the entire load.
b. The total line current supplied.
c. The total real, reactive, and apparent powers.

Problem # 4:

Consider the three-phase circuit below



$\mathbf{Z}_{\phi 1} = 2.5\angle 36.87° \Omega$

$\mathbf{Z}_{\phi 2} = 5\angle -20° \Omega$

(a) What is the line voltage of the two loads?

(b) What is the voltage drop on the transmission lines?

(c) Find the real and reactive powers supplied to each load.

(d) Find the real and reactive power losses in the transmission line.

(e) Find the real power, reactive power, and power factor supplied by the generator.

Problem # 5:

A single phase electrical load draws 10 MW at 0.6 power factor lagging.

a. Find the real and reactive power absorbed by the load
b. Draw the power triangle.
c. Determine the kVAR of a capacitor to be connected across the load to raise the power factor to 0.95.