KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT

EE 306 – Term 192

HW # 1: Three-Phase Circuits

Due Date: (Feb. 2nd for UT Classes and Feb. 3rd for MW Classes)

Problem # 1:

Given the number $A_1 = 5\angle 30^\circ$(in polar form) and $A_2 = -3 + j4$ (in rectangular form). Calculate the following, given the answers in both rectangular and polar forms:

a. $A_1 + A_2$
b. $A_1 * A_2$
c. $A_1/(A_2)^*$

Problem # 2:

A load with an impedance of$Z = 25\angle 53.1^\circ \Omega$is fed from a single-phase source of 220V.

a. Find the resistance and reactance of the load.
b. Find the real (active) and imaginary (reactive) power of the load.
c. Find the power factor of the load, and state whether it is lagging or leading.

Problem # 3:

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 # 4:

A balanced 3-phase Y-connected load with phase impedance of 20+*j*15 Ω is connected to a 400-V, 3-phase, 50-Hz supply. Calculate:

a. the line current.
b. the real and reactive power supplied.

If a 3-phase Δ-connected capacitor bank is connected parallel to the above load, calculate the capacitance per phase to obtain a resultant power factor of 0.95 lagging.

Problem # 5:

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

- A Δ-connected load with a phase impedance of (18+*j*24) Ω,
- A Y-connected load with a phase impedance of 10∠53.13° Ω.

Find:

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