



Aalto-yliopisto
Teknillinen korkeakoulu

Exercise Session 1

Power systems

Question 1

Show that the ratio of phase-to-phase-voltage and phase-to-earth-voltage is $\sqrt{3}$

Question 2

Derive the equation for delta-star transformation.

Question 3

A delta-connected three-phase load of $(80+j60) \Omega$ per phase is connected to a 440-V three-phase supply. Calculate:

- a) the current in the load component
- b) the current in the phase of the power line
- c) the total real power consumed (active power).

Question 4

A star-connected load consisting of a resistor of $80\ \Omega$ and an inductor of $0.191\ \text{H}$ in each phase is connected to a 415-V , three-phase, 50-Hz supply. Calculate:

- (a) the phase current I ;
- (b) the real power P consumed by the load; and
- (c) the reactive power Q consumed by the load.
- (d) From P and Q calculate the load phase angle ϕ , and show that:

$$P = \sqrt{3}VI \cos \phi$$

$$Q = \sqrt{3}VI \sin \phi$$