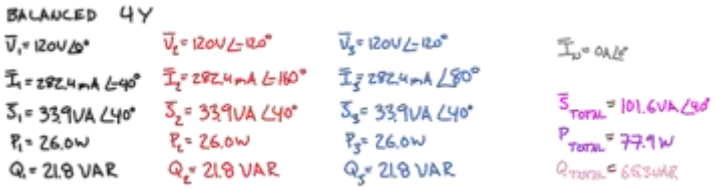
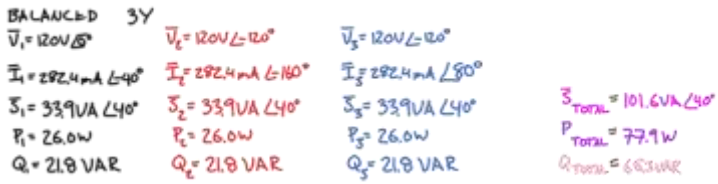
Single Wattmeter Method (36:26)

Given the following data, draw conclusions about total power measurement and neutral current for balanced Y configurations.

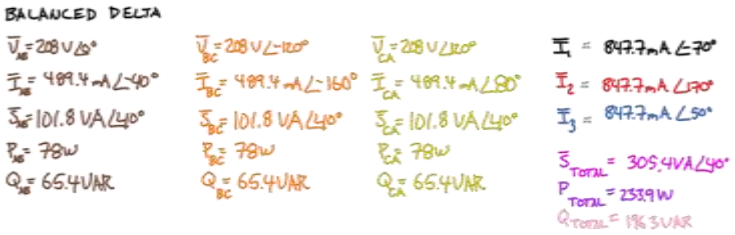
Balanced 4 wire Y and balanced 3 wire Y configurations:
$\mathbf{Z_2} = 425\Omega\angle 40°$
$\mathbf{Z_1} = 425\Omega\angle 40°$
$\mathbf{Z_3} = 425\Omega\angle 40°$





Given the following data, draw conclusions about total power measurement and line current measurement for balanced delta configurations.

Balanced delta configuration:
$\mathbf{Z_{AB}} = 425\Omega\angle 40°$
$\mathbf{Z_{BC}} = 425\Omega\angle 40°$
$\mathbf{Z_{CA}} = 425\Omega\angle 40°$



Summarize power measurement for 3 phase AC systems.

Describe a wattmeter. Draw a picture of the internal workings of a wattmeter.

Illustrate how 3 wattmeters could be used to measure power in 4 wire Y, 3 wire Y, and delta configurations. Identify advantages and disadvantages of using this method.

Illustrate how a single wattmeter could be used to measure power to an individual load in balanced 4 wire Y, 3 wire Y, and delta configurations. Identify advantages and disadvantages of using this method.

Illustrate how the single wattmeter method can be used to measure total power for a balanced 4 wire Y, 3 wire Y, and delta configurations. Identify advantages and disadvantages of using this method. Identify the formula used to determine total power.

Given a balanced Y configuration employing the single wattmeter method determine the total apparent power given the following data.

line current = 282.4mA
line to line voltage = 208V

Given a balanced delta configuration employing the single wattmeter method determine the total apparent power given the following data.

line current = 847.7mA
line to line voltage = 208V

Identify the error associated with the single wattmeter method regarding relative phase shift between voltage and current for a load.

Identify the methods used to derive power factor.

Determine the power factor of a device exhibiting a relative phase shift of -40° between voltage and current where voltage is assumed to be the reference.

Calculate real and reactive power for a device known to consume 101.7VA of apparent power with a lagging power factor of .7660.

Calculate real and reactive power for a device known to consume 305.4VA of apparent power with a lagging power factor of .7660.

Given the following data on a motor nameplate:

P_{MECH} = 5hp
V_{LL} = 208V/230V/460V
I_{LINE} = 12A/11.8A/5.9A
PF = .91
efficiency = 88.5%

Calculate total apparent power, total real power input, total reactive power, and total real power output when operated at 208V using the single wattmeter method.

For the above motor, calculate total apparent power, total real power input, total reactive power, and total real power output when operated at 230V using the single wattmeter method.

For the above motor, calculate total apparent power, total real power input, total reactive power, and total real power output when operated at 460V using the single wattmeter method.