For any questions, please feel free to send me an e-mail: mvural@gantep.edu.tr
Prof. Dr. Ahmet Mete VURAL

CURRENT CALCULATIONS IN POWER SYSTEMS

A. DC-SYSTEMS

- The voltage and current waveforms are constant.
- There is no frequency term.
- There is no reactive power associated with any component in the system.
- The **load current** $\boldsymbol{I}$ in *Amps* can be calculated as,

$$I = \frac{P}{V}$$

where, P is the load power (Watts) and V is the load voltage (Volts).

B. SINGLE-PHASE AC SYSTEMS

- The voltage and current waveforms are sinusoidally changing.
- The frequency of the voltage and current waveforms is either **50 Hz** or **60 Hz**.
- The **RMS load current** $\boldsymbol{I}$ in *Amps* can be calculated using any of the following equations;

$I = \frac{P}{V cos\theta}$	$I = \frac{S}{V}$	$I = \frac{Q}{V sin\theta}$

where, P is the load active (real, average) power (Watts), V is the RMS load voltage (Volts), $cos\theta$ is the power factor of the load, S is the apparent power of the load (VA), Q is the reactive power of the load (VAR).

C. THREE-PHASE AC SYSTEMS

- The voltage and current waveforms are sinusoidally changing.
- The frequency of the voltage and current waveforms is either **50 Hz** or **60 Hz**.
- The **RMS <u>line current</u> of the load** $\boldsymbol{I_L}$ in *Amps* can be calculated using any of the following equations;

The load is connected as either ***WYE*** or ***DELTA***

$I_L = \frac{P}{\sqrt{3} V_L cos\theta}$	$I_L = \frac{S}{\sqrt{3} V_L}$	$I_L = \frac{Q}{\sqrt{3} V_L sin\theta}$

where, P is the three-phase load active (real, average) power (Watts), V_L is the line-to-line (line) RMS load voltage (Volts), $cos\theta$ is the power factor of the load, S is the three-phase apparent power of the load (VA), Q is the three-phase reactive power of the load (VAR).

- The **RMS <u>phase current</u> of the load** $\boldsymbol{I_\emptyset}$ in *Amps* can be calculated using any of the following equations;

The load is connected as either ***WYE*** or ***DELTA***

$I_\emptyset = \frac{P}{3 V_\emptyset cos\theta}$	$I_\emptyset = \frac{S}{3 V_\emptyset}$	$I_\emptyset = \frac{Q}{3 V_\emptyset sin\theta}$

where, P is the three-phase load active (real, average) power (Watts), $V_\emptyset$ is the phase RMS load voltage (Volts), $cos\theta$ is the power factor of the load, S is the three-phase apparent power of the load (VA), Q is the three-phase reactive power of the load (VAR).

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