Topic 8 recap

- **Nodal** and **mesh analysis** are applied to AC circuits the same way as in DC circuits.
  - Nodal equations (KCL) and mesh equations (KVL) should be written for an AC circuit in phasor domain when it is operated in steady state sinusoidal conditions.
- **Superposition** can also be applied to AC circuits with multiple independent sources in phasor domain.
  - When having sources with **different frequencies only superposition** can be used to find the steady state response of the circuit.
    - A separate phasor circuit must be solved for each frequency independently.
    - The overall response is the sum of the time domain responses of all individual phasor circuits.
  - If the **frequencies are the same**, the sum of the phasor responses will be used as the final response and then transformed back to time domain if needed.
- The concept of **source transformation** is also applicable in the frequency domain.

Topic 8 recap

- **Thevenin** and **Norton equivalent** circuits can also be used for AC circuits in phasor domain.
  - The Thevenin equivalent circuit consists of a voltage source $\mathbf{V}_{\mathrm{Th}}$ in series with the Thevenin equivalent impedance $\mathbf{Z}_{\mathrm{Th}}$:
    - $\mathbf{V}_{\mathrm{Th}} = \mathbf{V}_{oc}$: Open-circuit phasor voltage across the given terminals.
    - $\mathbf{Z}_{\mathrm{Th}} = \mathbf{Z}_{\mathrm{eq}}$: Equivalent impedance as seen from the given terminals.
  - The Norton equivalent circuit consists of a current source $\mathbf{I}_N$ in parallel with the Norton equivalent impedance $\mathbf{Z}_N$:
    - $\mathbf{I}_N = \mathbf{I}_{sc}$: Short-circuit current through the given terminals.
    - $\mathbf{Z}_N = \mathbf{Z}_{\mathrm{Th}} = \mathbf{Z}_{\mathrm{eq}}$: Equivalent impedance as seen from the given terminals.
  - **Thevenin-Norton transformation** is the same as in DC:

$$\mathbf{I}_N = \frac{\mathbf{V}_{\mathrm{Th}}}{\mathbf{Z}_{\mathrm{Th}}} \text{ and } \mathbf{V}_{\mathrm{Th}} = \mathbf{Z}_N \mathbf{I}_N$$