Review Notes
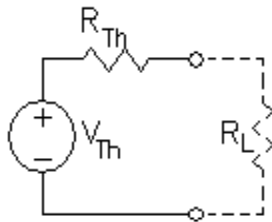
Thévenin equivalent

To calculate the Thévenin equivalent:

1) Disregard the load and calculate the open-circuit voltage. This is the Thévenin voltage (V_{Th}).
2) Zero all the sources. (To zero a voltage source, replace it with a short. To zero a current source, replace it with an open.)
3) Compute the total resistance between the load terminals. (DO NOT include the load in this resistance.) This is the Thévenin source resistance (R_{Th}).
4) Draw the Thévenin equivalent circuit and add your values.

NOTE: Same procedure for impedances, but V_{Th} may have a phase angle and R_{Th} will be Z_{Th}.

Norton equivalent

To calculate the Norton equivalent:

1) Disregard the load and calculate the short-circuit current. This is the Norton current (I_N).
2) Zero all the sources. (To zero a voltage source, replace it with a short. To zero a current source, replace it with an open.)
3) Compute the total resistance between the load terminals. (DO NOT include the load in this resistance.) This is the Norton source resistance (R_N). (Exactly the same Thévenin source resistance (R_{Th})).
4) Draw the Norton equivalent circuit and add your values.

OR...

1) Find the Thévenin equivalent circuit.
2) Convert to Norton circuit, $R_N = R_{Th}$ and $I_N = V_{th}/R_{Th}$.

NOTE: Same procedure for impedances, but I_N may have a phase angle and R_N will be Z_N.

Superposition

For circuits with **more than 1 source**.

1) Zero all but one source. (To zero a voltage source, replace it with a short. To zero a current source, replace it with an open.)
2) Compute your wanted voltage or current due to the remaining source. Careful, some may be negative.
3) Repeat the first two steps for all the sources.
4) Sum all the contributions from all the sources to find the actual voltage or current. **Watch your signs!**
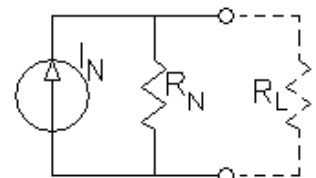
Q-point Analysis

Variation of superposition for circuits with **DC power supply(s) and AC signals**.

1) Zero all signal sources.
2) Consider all coupling and bypass capacitors as open.
3) Use special DC models for non-linear parts and/or active elements.
4) Compute the DC voltages or currents.
5) Check your assumptions and models.

Small-Signal Analysis

Variation of superposition for circuits with **DC power supply(s) and AC signals**.

1) Zero all DC sources. (To zero a voltage source, replace it with a short. To zero a current source, replace it with an open.)
2) Consider all coupling and bypass capacitors as shorts.
3) Use special small-signal models for non-linear parts and/or active elements. Some may depend on Q-point values.
4) Compute the signal voltages or currents of interest.
5) Check your assumptions and models.