

ECE2019 Lecture 8

Thevenin Examples (2.6)
Superposition (2.7)

Handout:

- Superposition Analysis Steps

Analysis Examples:

- Superposition
- Superposition Guiding Design
- Repeated Thevenin

For Next Lecture: Read 3.1-3.3

Superposition Analysis Steps

- 1 Set all independent sources to zero
V source \rightarrow short circuit
I source \rightarrow open circuit
- 2 Turn on each independent source, one at a time.
- 3 Calculate response due to each individual independent source.
- 4 For total response, add up individual contributions from each source

Superposition Cautions

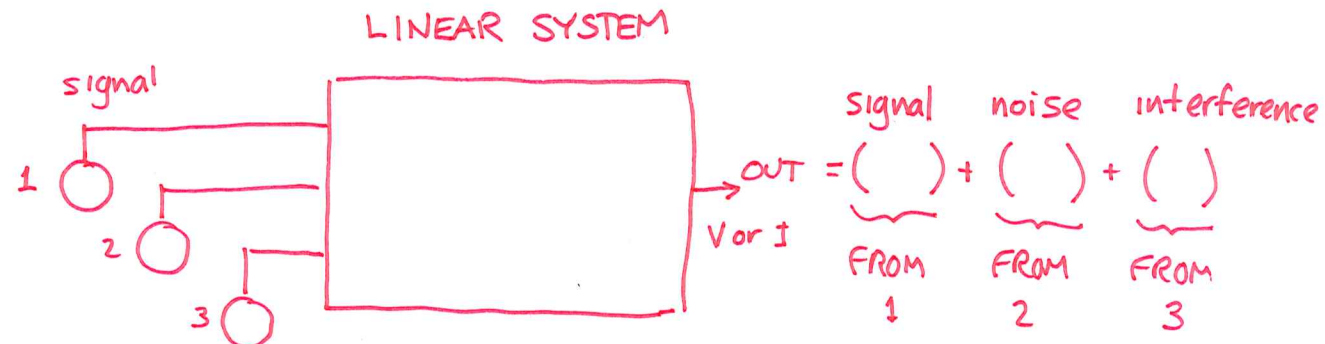
Only applies to linear systems!

Do not turn off dependent sources!

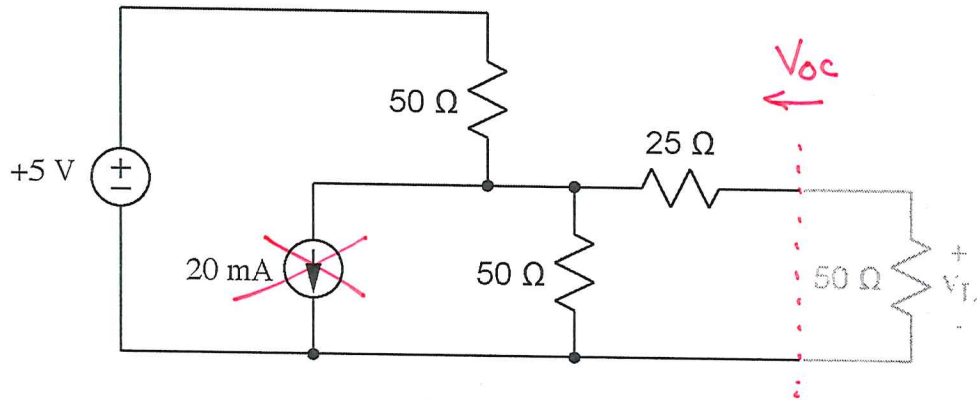
Why Use Superposition?

Usually simplifies analysis when circuit has many independent sources

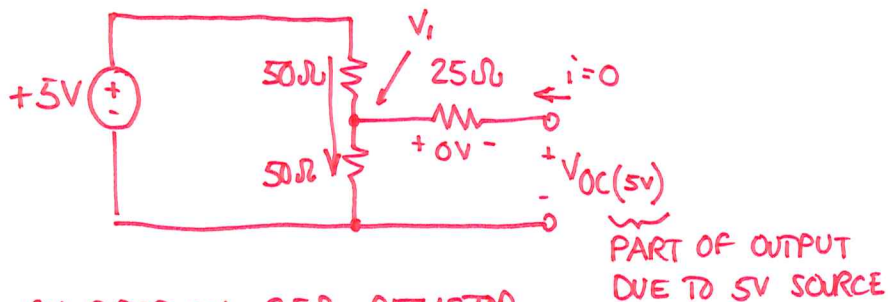
Explicitly shows path from each source to output: "assign blame"
(signal, noise)



FIND V_{oc} (FOR THEVENIN) USING SUPERPOSITION



TURN OFF 20 mA SOURCE: OPEN CIRCUIT
REDRAW

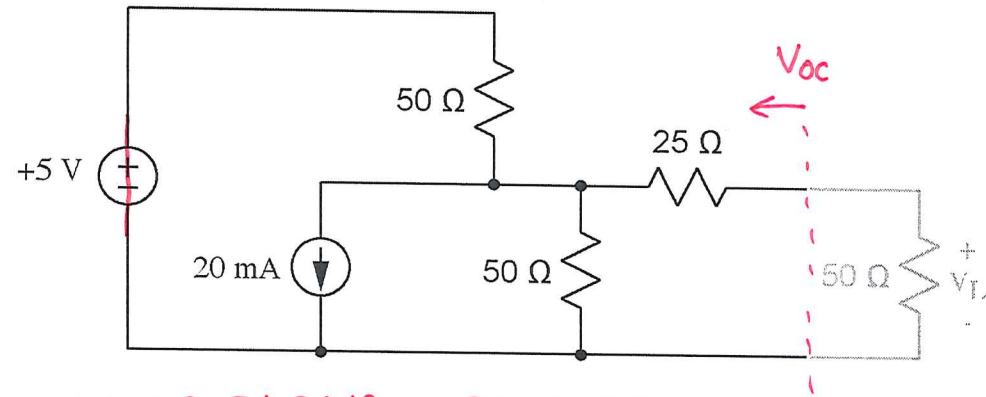


0V DROP ON 25Ω RESISTOR

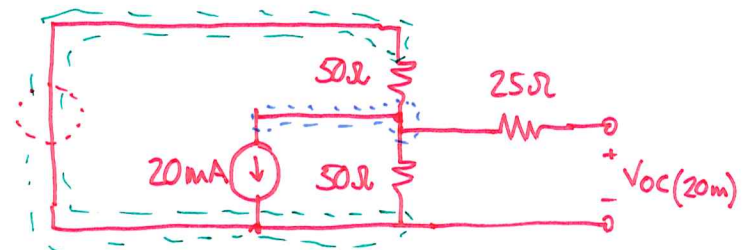
VOLTAGE DIVIDER

$$V_i = \left(\frac{50}{50+50} \right) 5V = +2.5V = V_{oc(5v)}$$

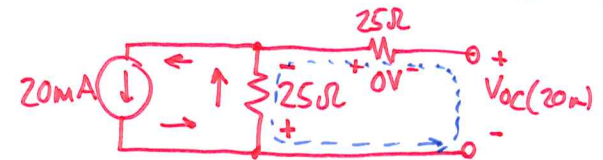
ADD BY
SUPERPOSITION



TURN OFF 5V SOURCE: SHORT CIRCUIT



50Ω RESISTORS IN PARALLEL: $50\Omega \parallel 50\Omega = 25\Omega$



KVL: $+V_{oc(20m)} + \underbrace{(20mA)(25\Omega)}_{0.5V} = 0 \Rightarrow \underline{V_{oc(20m)} = -0.5V}$

$$V_{oc} = V_{oc(5v)} + V_{oc(20m)} = +2.5V + (-0.5V) = +2V \checkmark$$