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ECE 2040  
CHAPTER 5: CIRCUIT THEOREMS (SUMMARY)

SOURCE TRANSFORMATIONS



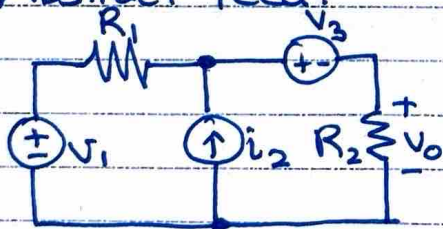
$$V_s = i_s R_p$$

$$i_s = \frac{V_s}{R_s}$$

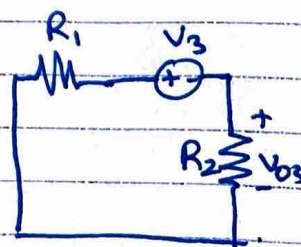
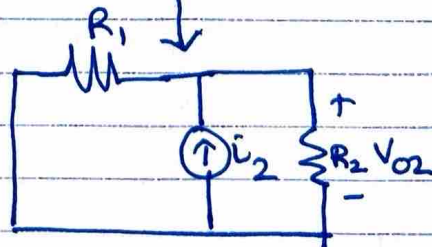
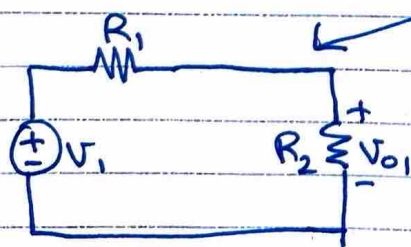
SUPERPOSITION

- \* Ckt must be linear (consist of only resistors, dependent & independent sources)
- \* Inputs = Independent sources ONLY (NOT dependent)
- \* Output of linear ckt =  $\sum$  output due to each input working separately
- \* i.e. set remaining independent voltage sources to 0V  
           "          "          "          Current          "          " 0A

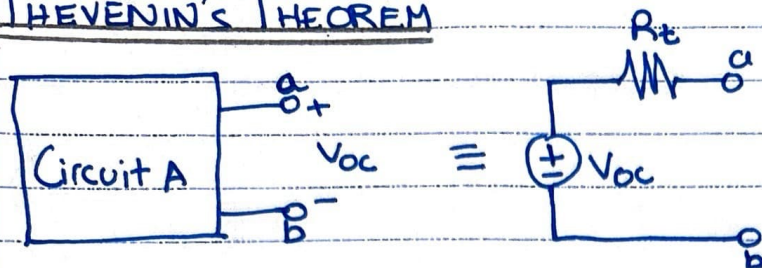
Abstract idea:



$$V_0 = V_{01} + V_{02} + V_{03}$$



## THEVENIN'S THEOREM



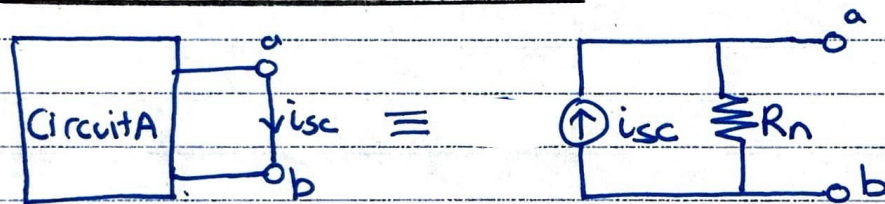
$R_t$  = Thevenin resistance, found by calculating

→ equivalent resistance across Circuit A\*

→ Calculating  $i_{sc}$ ,  $R_t = \frac{V_{oc}}{i_{sc}}$  (when dependent sources are present)

\* Circuit A\*  $\equiv$  Circuit A w/ all independent voltage sources replaced by short circuits & all independent current sources replaced by open circuits.

## NORTON EQUIVALENT CIRCUIT



$R_n = R_t$  &  $V_{oc} = R_t i_{sc}$  (Source transformation on Thevenin)

## MAXIMUM POWER TRANSFER

Max. power delivered to a load is attained when  $R_L = R_t$

$$P_{max} = \frac{V_s^2 R_t}{(2R_t)^2} = \frac{V_s^2}{4R_t}$$

$$(or) P_{max} = \frac{R_t i_{sc}^2}{4}$$