

Dr. Mohamed Bakr, EE2C15, 2007

Note Title

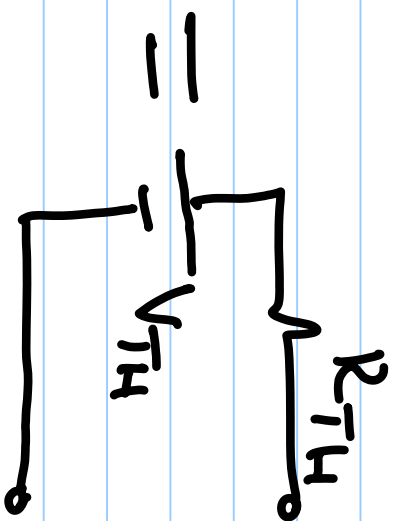
10/7/2007

Lecture 14

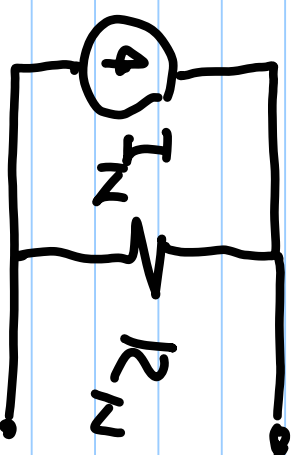
From Section 5.4 of Textbook

Solve ES.7, 5.79, 5.82, 5.84,
5.87, 5.93, 5.97, 5.98, 5.101

Source Transformation



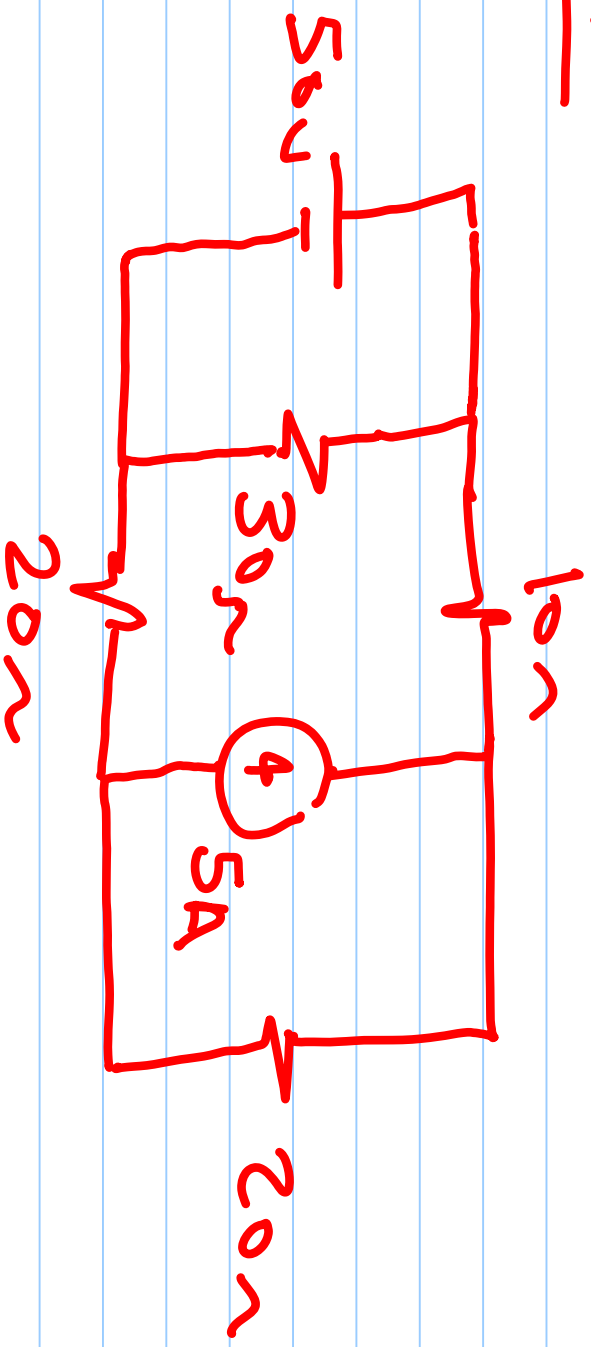
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* $R_N = R_{TH}$ and $I_N = V_{TH}/R_{TH}$

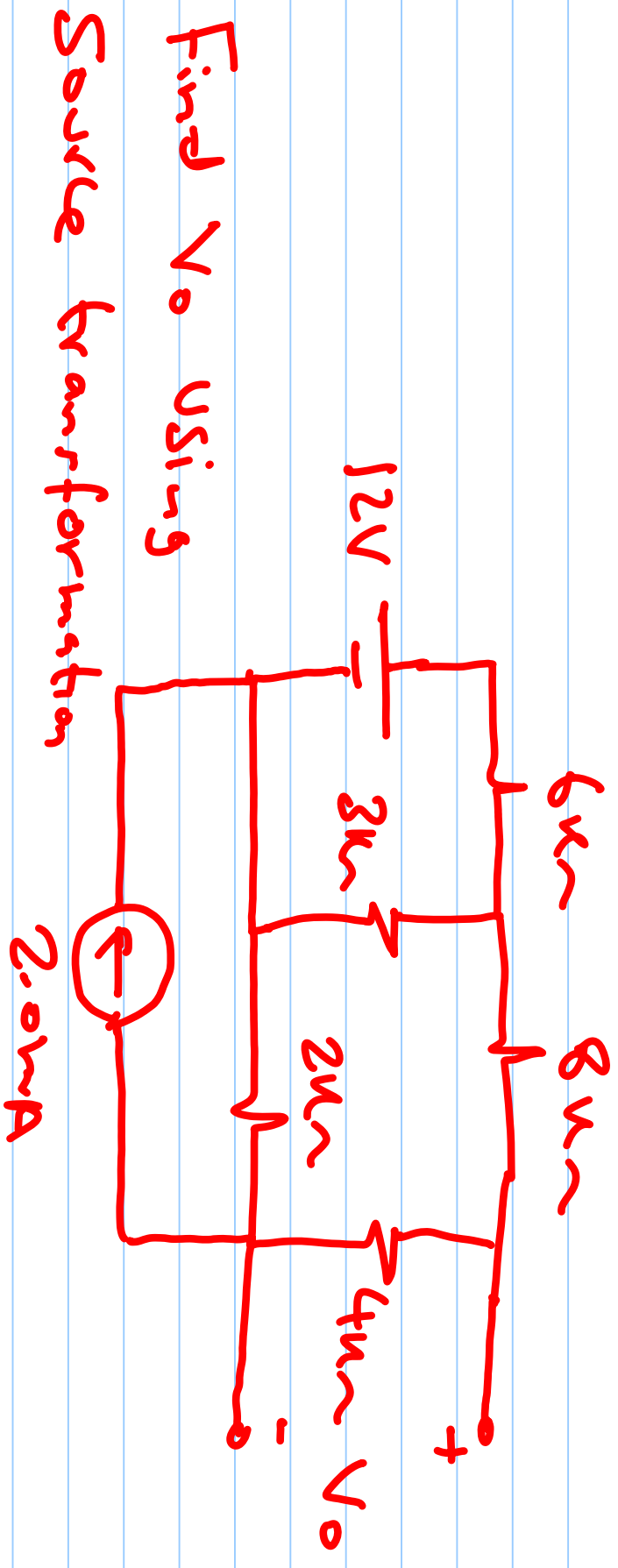
* Voltage Source in Series with a resistor can be replaced with a current source in parallel with the same resistor and vice versa.

Example



Use Source transformation to find the current in the 10Ω resistor

Example



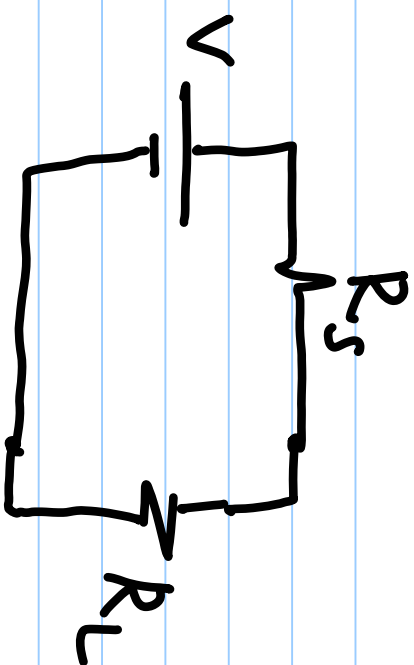
Maximum Power Transfer

* power delivered to R_L is

$$P_L = V * \frac{R_L}{R_L + R_S} * \frac{V}{R_S + R_L}$$

$$P_L = \frac{V^2 R_L}{(R_L + R_S)^2}$$

* What is value of R_L that ensures maximum power transfer?



Power Transfer

* Differentiating P_L w.r.t. R_L and set equal to zero

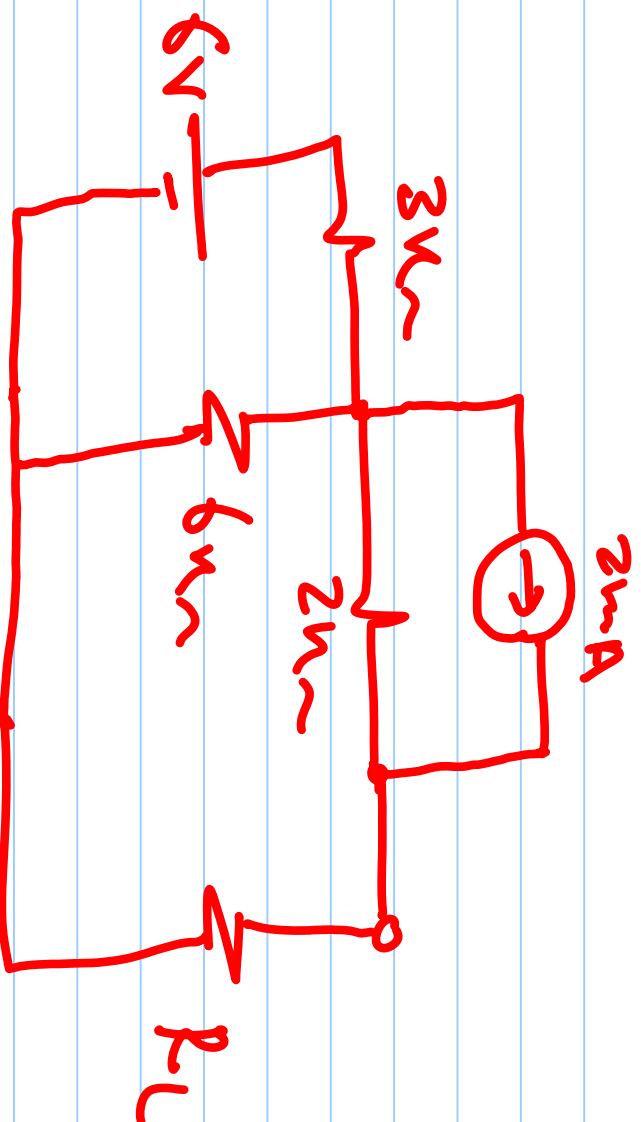
$$\frac{\partial P_L}{\partial R_L} = V^2 \left[\frac{(R_S + R_L)^2 - R_L * 2(R_S + R_L)}{(R_S + R_L)^4} \right] = 0$$

$$R_L = -R_S \quad (\text{rejected})$$

$$\text{or } (R_S + R_L) - 2R_L = 0 \Rightarrow R_L = R_S$$

* Load Resistance = Source Resistance

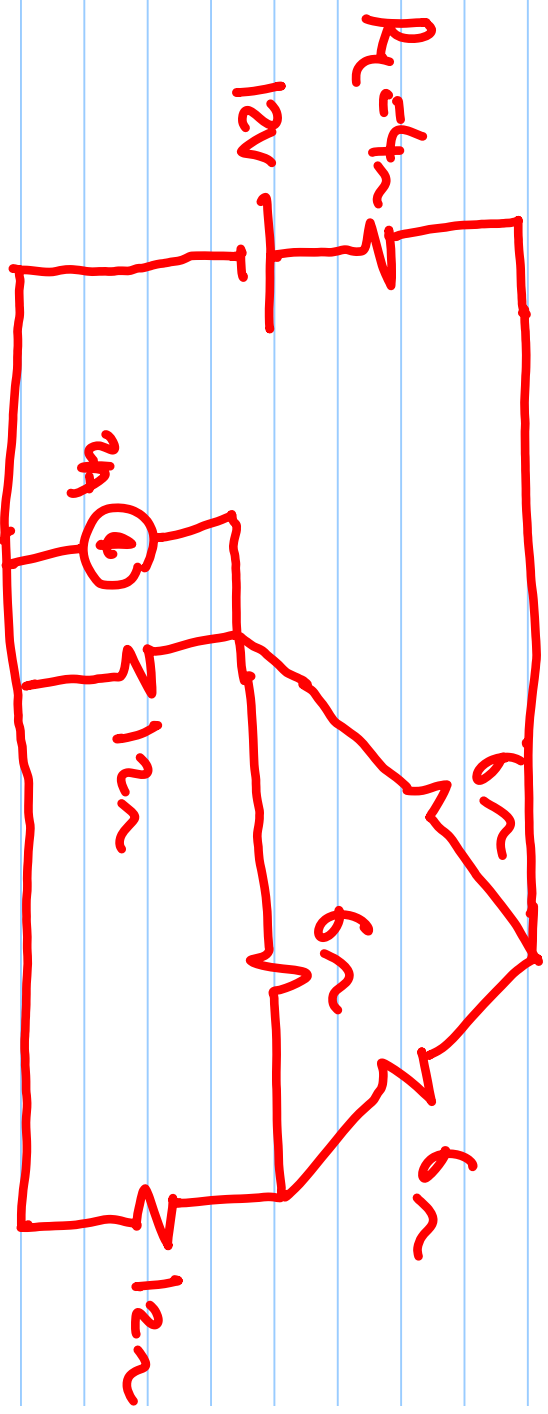
Example



Find R_L for maximum power transfer.

What is the value of this maximum power?

Example



Find the power delivered to the 4Ω resistor.

What should be the value of R_L for maximum power transfer? What is P_{max} ?