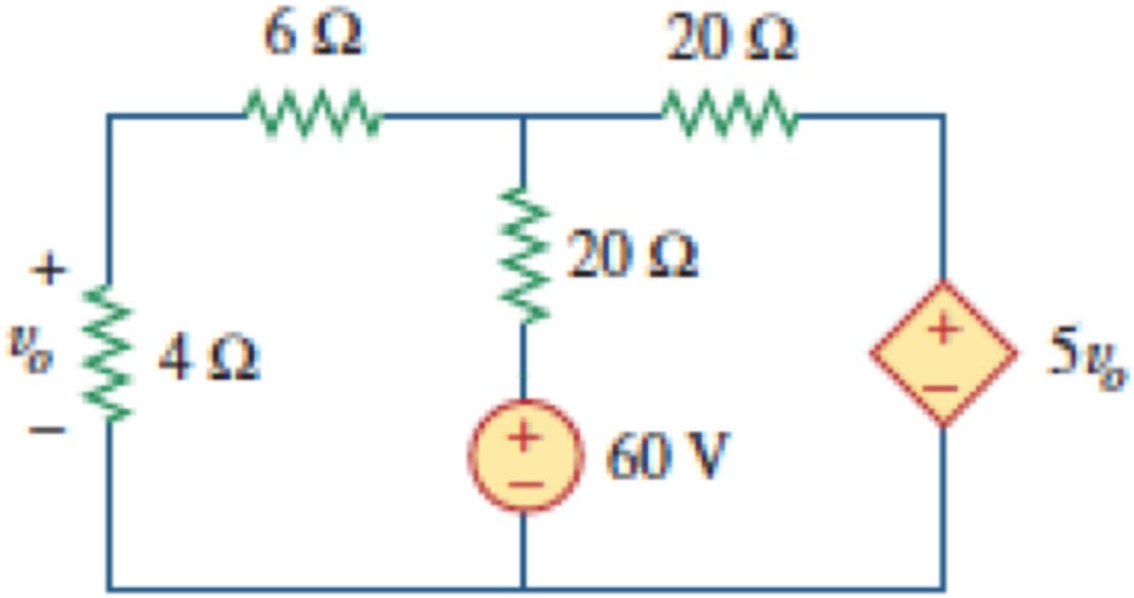
Lecture 11
Node Analysis – 4 of 7

dependent sources

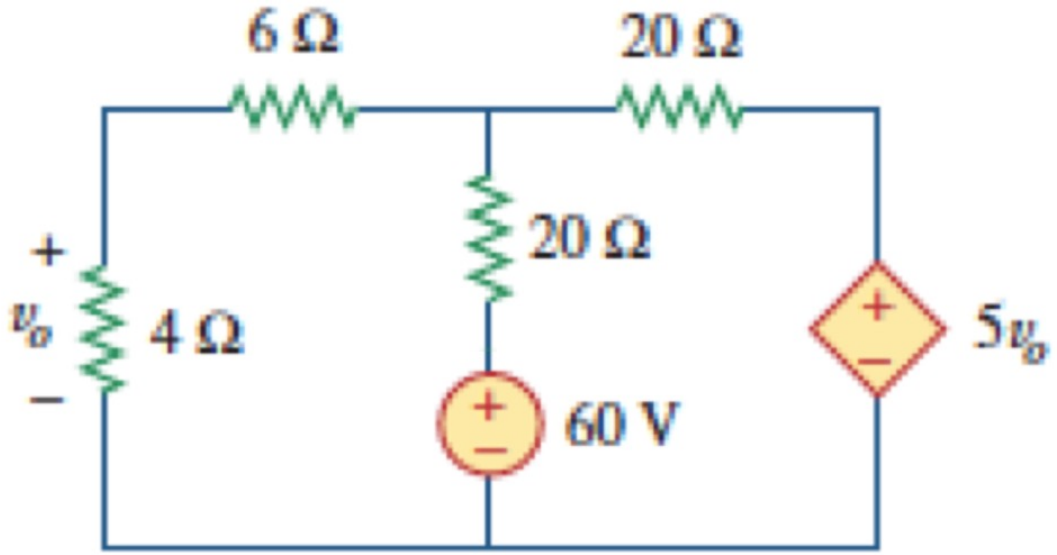
Extension #3 – dependent sources

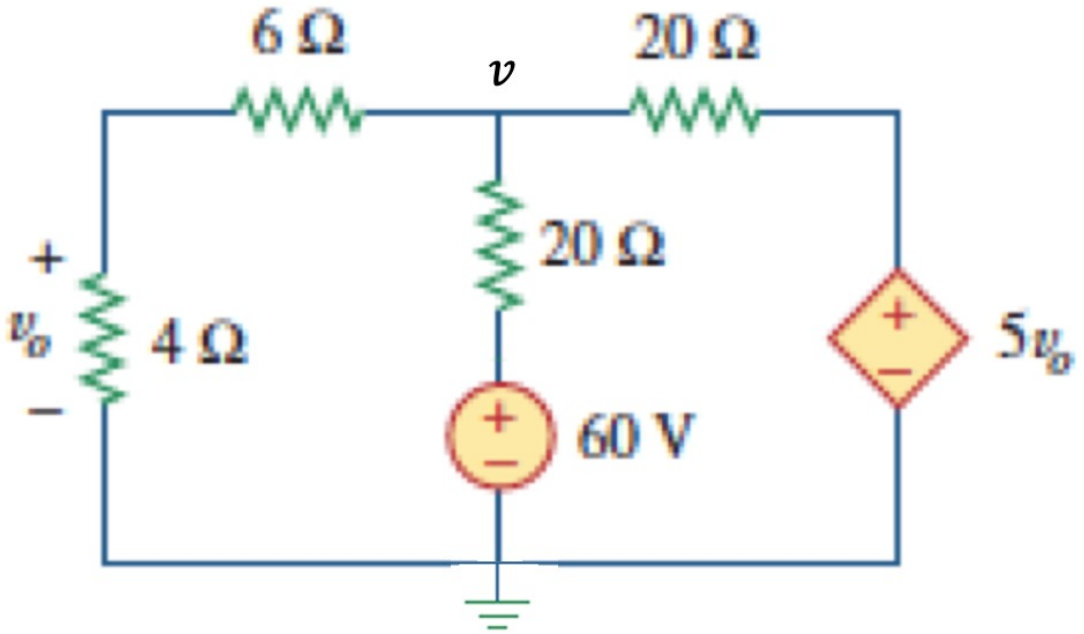
- Consider:



  - Write node equations as usual,
  - Add an equation "defining" the controlling variable in terms of the node voltages

Example (solved on next slide)





Node equation:

$$\frac{v}{10} + \frac{v - 60}{20} + \frac{v_1 - 5v_0}{20} = 0$$

Relate v_0 to the node:

$$v_0 = \frac{4}{10} v$$

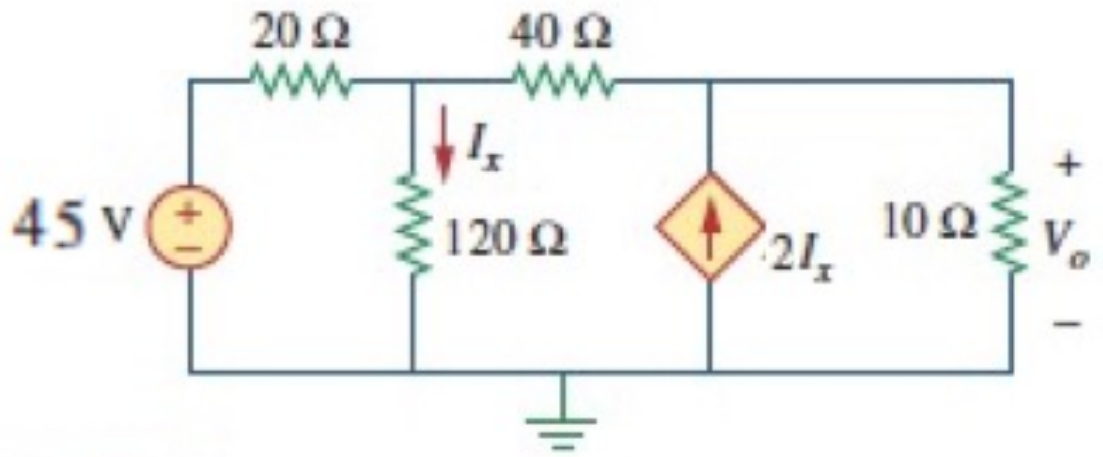
$$4v - 5v_0 = 60$$

$$4v - 5\frac{4}{10}v = 60$$

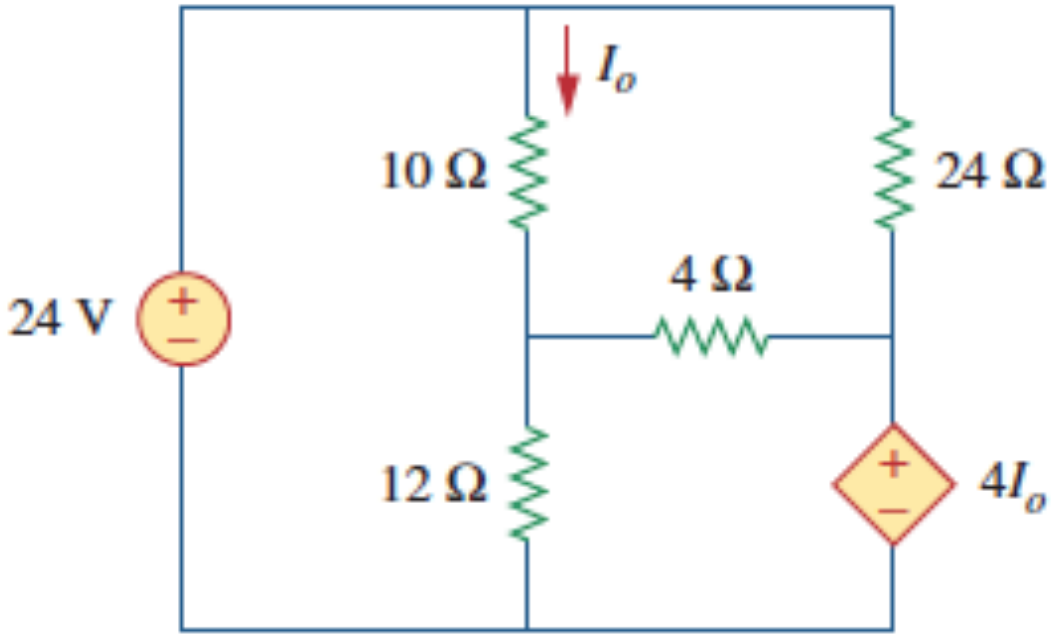
$$v = 30\ volts$$

$V_o = 10\ V$

Example: find V_0



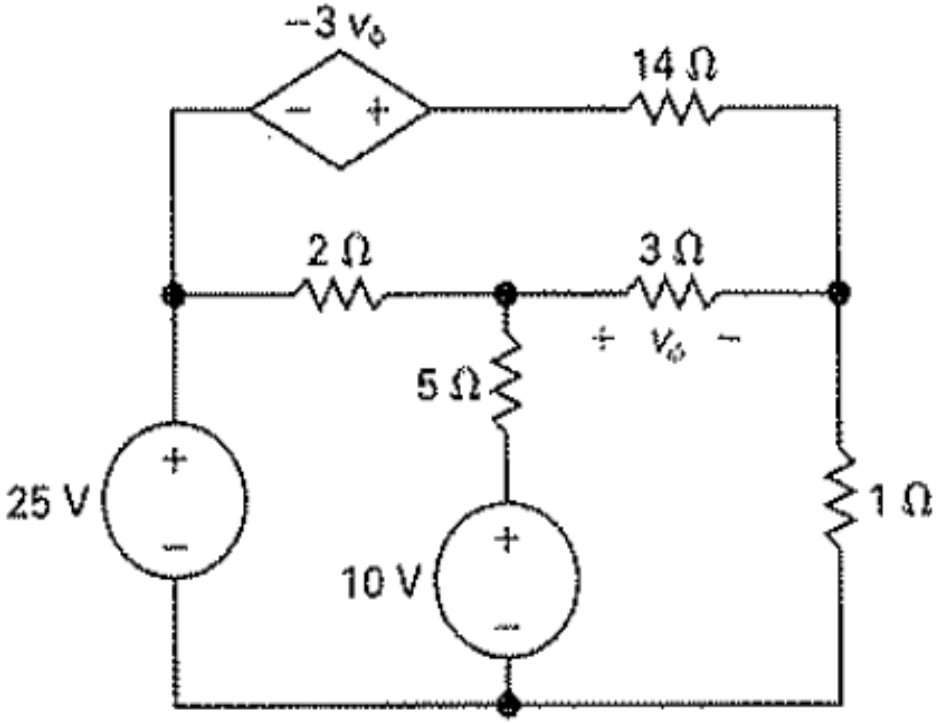
Example:



$v_L = 9\ V,$
$i_0 = 1.5\ A$
$v_R = 6\ V$

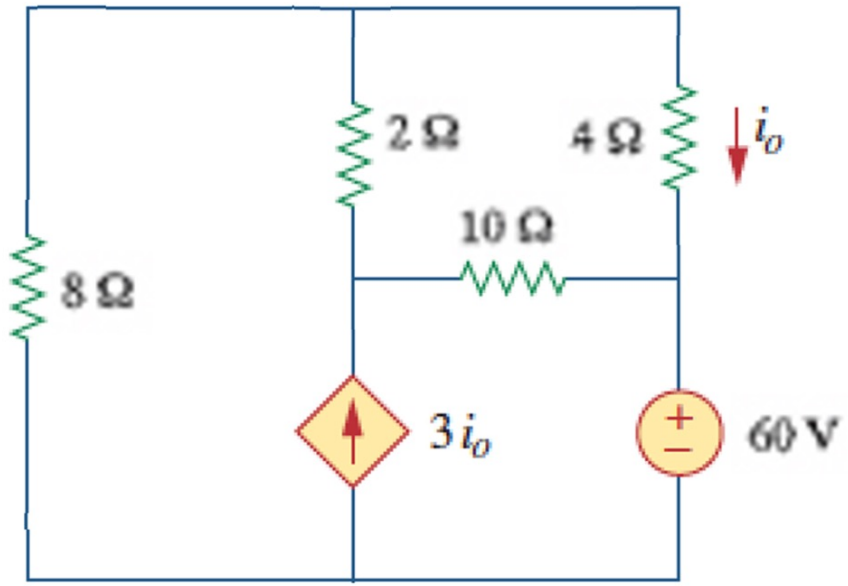
P = – 36 W

Example: find the power of the dependent source



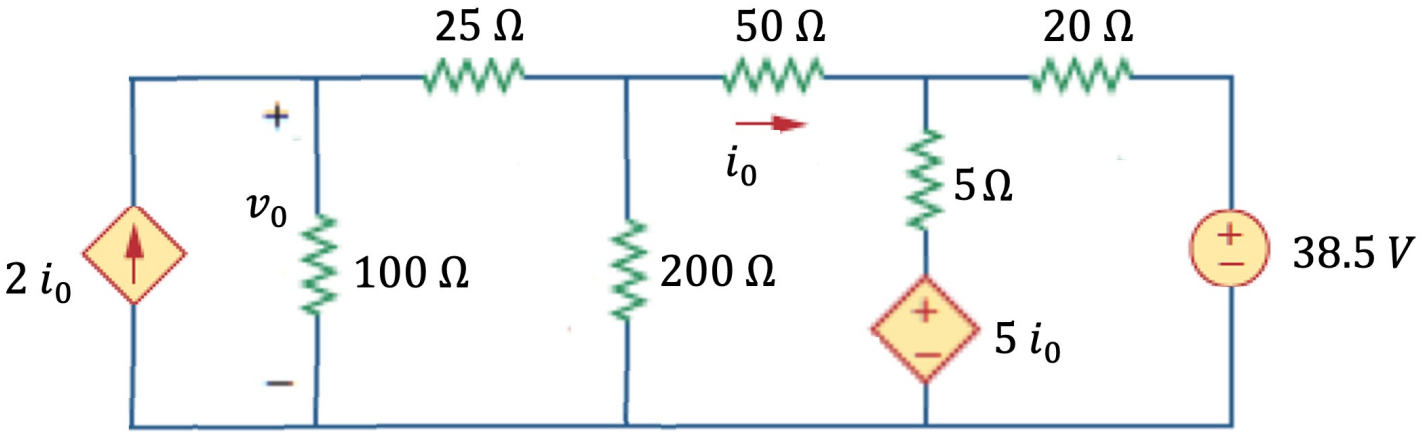
$i_0 = 11.25\ A$

Practice problem: find i_0



$v_o = -50\ V$

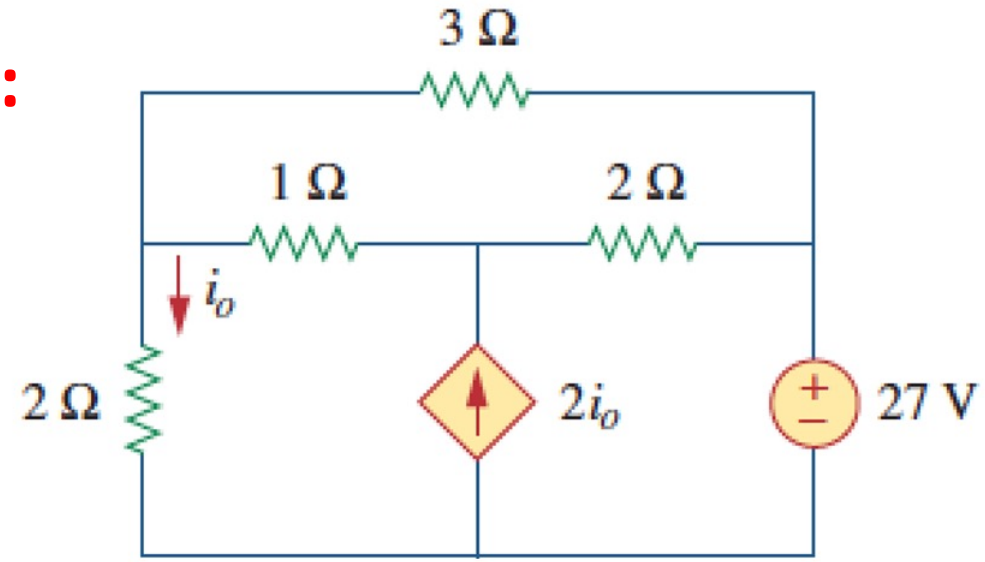
Practice problem: find v_0



$v_L = 36\ V$

$v_R = 57\ V$

Practice Problem:



I_0=7.5 A

Practice problem: find I_0