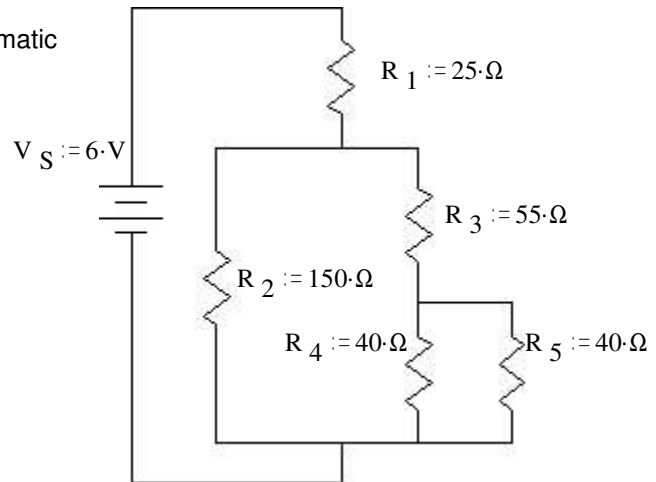# EE1050/60 Exam 1   given: Spring 02 (The space between problems has been removed.)

Remember, to get the most possible partial credit, always show all the intermediate values that you can calculate. If further calculations depend on a value that you can't figure out, just use a letter (like I_{R1}) or a guessed value and proceed.
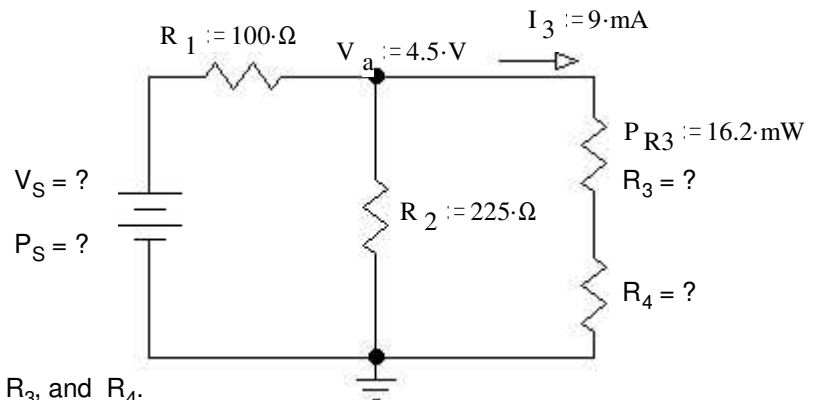
Note: feel free to show answers & work right on the schematic

1. (16 pts) In the circuit shown, find:

   a) The voltage across R_2. $V_{R2} = ?$

   b) The current through R_3. I_{R3} = ?

$R_1 := 25 \cdot \Omega$

$V_S := 6 \cdot V$

$R_3 := 55 \cdot \Omega$

$R_2 := 150 \cdot \Omega$

$R_4 := 40 \cdot \Omega$ $R_5 := 40 \cdot \Omega$

2. (20 pts) In the circuit shown find the voltage source (V_S), the power input by the source (P_S), and the resistor values; R_3 and R_4.

$V_S = ?$

$P_S = ?$

$R_1 := 100 \cdot \Omega$ $V_a := 4.5 \cdot V$ $I_3 := 9 \cdot mA$

$P_{R3} := 16.2 \cdot mW$

$R_3 = ?$

$R_2 := 225 \cdot \Omega$

$R_4 = ?$

Reminder, you were asked for 4 items: V_S, P_S, R_3, and R_4.

3. (19 pts) a) Use the method of superposition to find the current through R_2. Be sure to clearly show and **circle** your intermediate results.

$R_1 := 2 \cdot k\Omega$

$I_S V_S 0 = 18 \cdot V$

I_{R2}

$R_2 := 6 \cdot k\Omega$

$R_3 := 3 \cdot k\Omega$

$I_S := 12 \cdot mA$
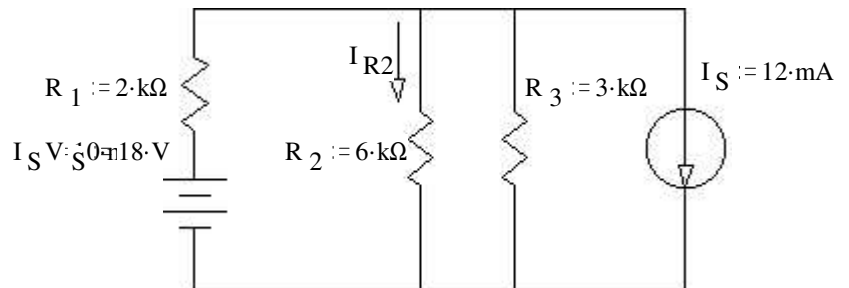
4. (16 pts) Nodal analysis.
   a) Select a ground (reference) node and label it on the schematic (draw ground symbol).

   b) Label other nodes and currents as necessary to perform nodal analysis.

   c) How many simultaneous equations will you need to perform this analysis?

   d) Write all the necessary equations in terms of the resistors, the sources, and the unknown nodes. Just write and circle the equations, do not try to simplify or solve them.

R_1

R_2 R_3 R_4

V_S I_S
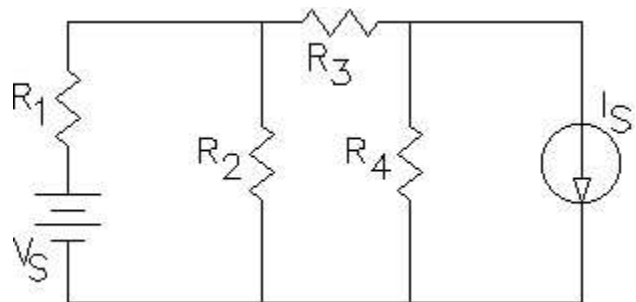
5. (20 pts) For the waveform shown, find:
   a) peak-to-peak voltage, V_{pp}
   b) amplitude, A
   c) period, T
   d) frequency f in cycles/sec or Hz
   e) frequency ω in radians/sec
   f) the phase angle in degrees
   g) a complete expression for v(t), include numbers and units
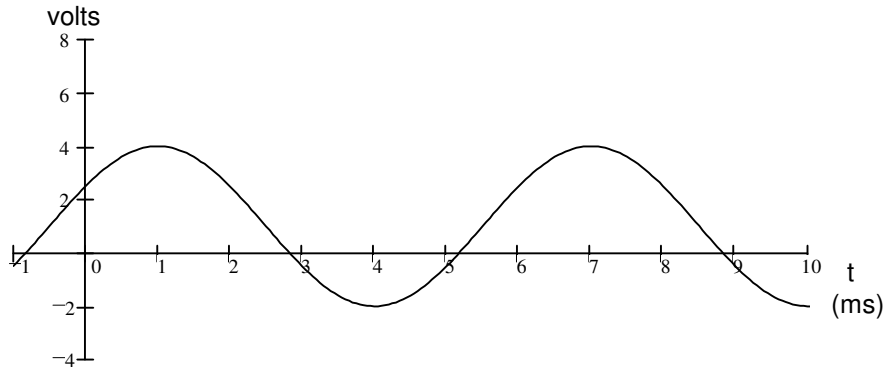
The questions below are similar to what you might see on the FE exam. They expect you to average about 2 minutes per question.
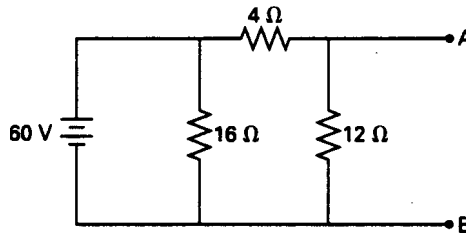
6. (4 pts)   Find the magnitude and sign of the power, in watts, absorbed by the circuit element in the box.

   a) -20   b) -8   c) 8   d) 12
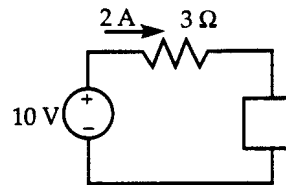
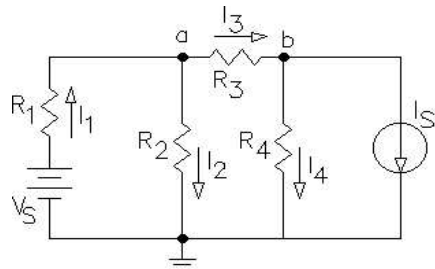7. (5 pts)   What are the Thevenin equivalent resistance and voltage between terminals A and B?

   a) $R_{Th} = 3\ \Omega$, $V_{Th} = 45$ V
   b) $R_{Th} = 7.5\ \Omega$, $V_{Th} = 7.5$ V
   c) $R_{Th} = 7.5\ \Omega$, $V_{Th} = 60$ V
   d) $R_{Th} = 12\ \Omega$, $V_{Th} = 5$ V

Hint: You don't have to figure out the entire Thevenin equivalent circuit to figure out which answer is right.

Answers

1. a) $4 \cdot V$ b) $53.3 \cdot mA$

2. $V_S := 7.4 \cdot V$ $P_S := .215 \cdot W$ $R_3 := 200 \cdot \Omega$ $R_4 := 300 \cdot \Omega$

3. $I_{R2.V} := 1.5 \cdot mA$ $I_{R2.I} := -2 \cdot mA$ $I_{R2} := -0.5 \cdot mA$

4. a) & b)

   c)   2
   d)

$$\frac{V_S - V_a}{R_1} = \frac{V_a - 0}{R_2} + \frac{V_a - V_b}{R_3} \quad , \quad \frac{V_a - V_b}{R_3} = \frac{V_b - 0}{R_4} + I_S$$

5. a) $6 \cdot V$ b) $3 \cdot V$ c) $6 \cdot ms$ d) $167 \cdot Hz$ e) $1047 \cdot \dfrac{rad}{sec}$

   f) -60°   g) $3 \cdot V \cdot \cos\left(1047 \cdot \dfrac{rad}{sec} \cdot t - 60 \cdot deg\right) + 1 \cdot V$

6. c   7. a

EE 1050 / 60   Midterm #1

Arn Stolp

Name _____

Scores:
Page 1&2 _____ of a possible 36 pts

Page 3&4 _____ of a possible 35 pts

Page 5&6 _____ of a possible 29 pts

Total _____ of a possible 100 pts