# ECE 2210/00 Exam 1   given: Spring 14   (The space between problems has been removed.)

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.

1. (20 pts) The ammeter, A, reads 40 mA.
   a) The power dissipated by R_2 is 90 mW, what is the value of R_2?

   $R_1 := 80 \cdot \Omega$

   $R_{|22} := 90 \cdot mW$

   $= ?$

   $R_4 := 50 \cdot \Omega$
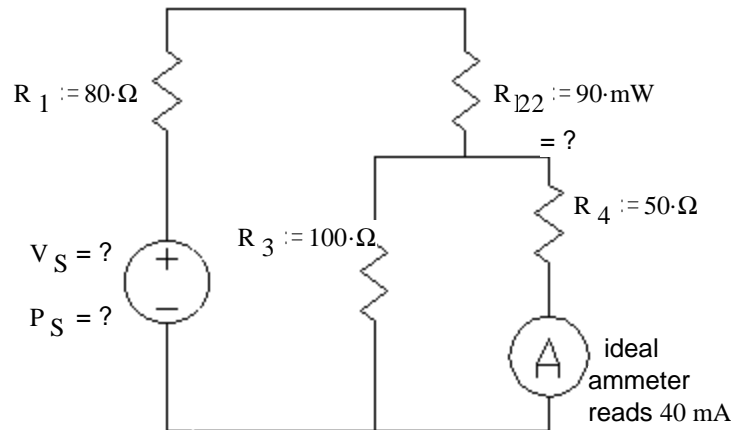
   b) What is the value of V_S?

   $R_3 := 100 \cdot \Omega$

   $V_S = ?$

   c) How much power is provided by the source? $P_S = ?$

   ideal ammeter reads 40 mA

2. (23 pts) a) Use the method of superposition to find V_{R1} and I_{R2}. Be sure to clearly show and **circle** your intermediate results.

   $V_S := 15 \cdot V$

   V_{R1} $R_1 := 4 \cdot k\Omega$

   $R_2 := 2 \cdot k\Omega$

   $I_S := 6 \cdot mA$

   I_{R2}

   $R_3 := 3 \cdot k\Omega$
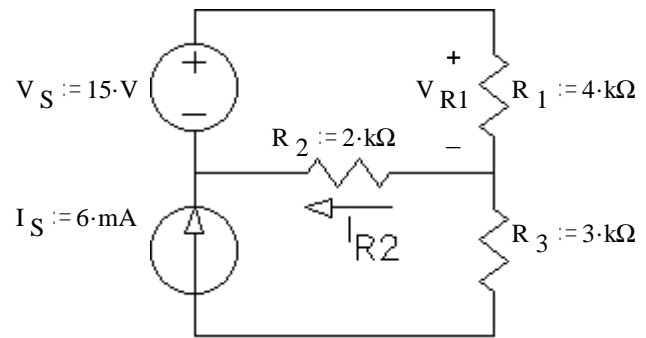
3. (18 pts)
   a) Find and draw the Thévenin equivalent of the circuit shown. The load resistor is R_L.

   $R_1 := 360 \cdot \Omega$ $R_2 := 440 \cdot \Omega$

   $I_S := 20 \cdot mA$

 $R_3 := 360 \cdot \Omega$ $R_L := 400 \cdot \Omega$
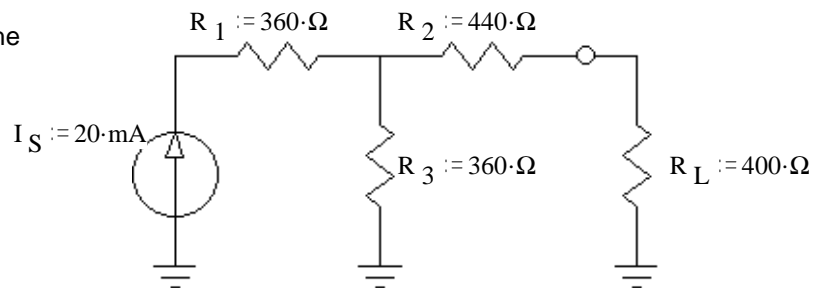
   b) Find and draw the Norton equivalent of the same circuit.

   c) Find the load voltage using either your Thévenin or Norton equivalent circuit.

4. (18 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.

   I_S

   R_1

   R_3

   R_2

   R_4

   V_S
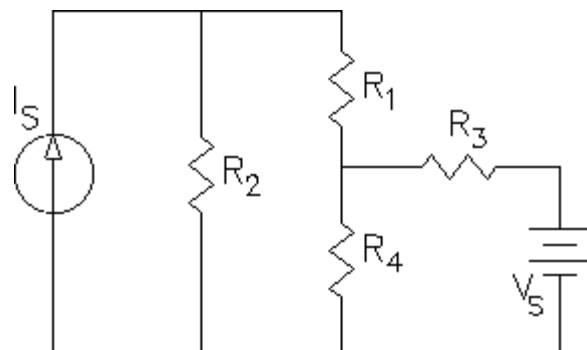
5. (21 pts) The questions below are similar to what you might see on the FE exam, except that guesses could cost you points here. They expect you to average about 2 minutes per question. Circle the right answers.
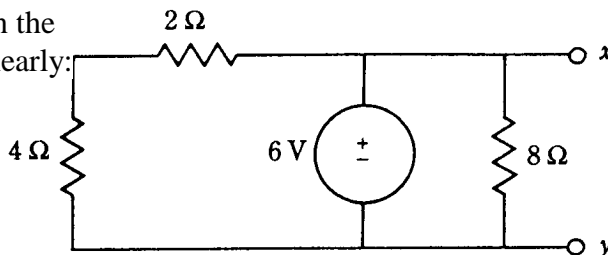
a) The value of the resistor is most nearly:

  (A) 0.1 Ω
  (B) 2.7 Ω
  (C) 10   Ω
  (D) 30   Ω
  (E) 33.3 Ω
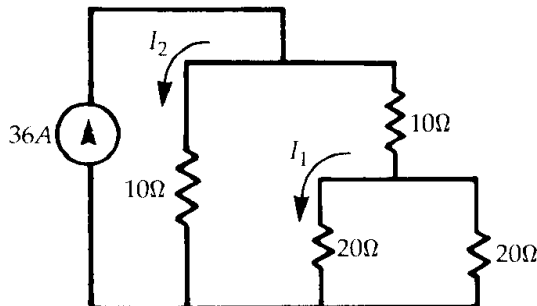
$V_S := 3 \cdot V$ $P_R := 0.3 \cdot W$ $R = ?$
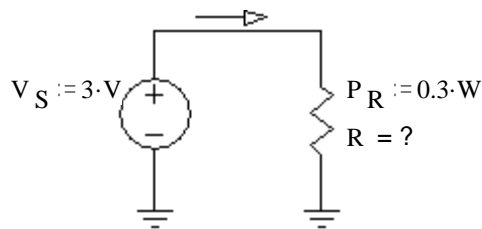
b) If a 3-ohm resistor is connected across terminals xy in the circuit shown, the current through it would be most nearly:

  (A) 0.5   A
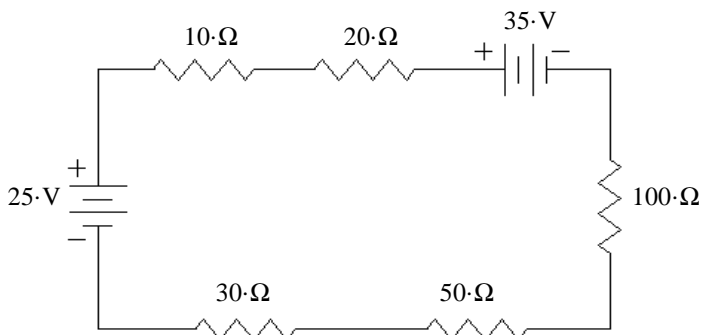 (B) 0.75 A
  (C) 1.75 A
  (D) 2.0   A
  (E) 3.75 A

2 Ω   4 Ω   6 V   8 Ω

c) Find I_2 in amps.

  (A) 9
  (B) 12
  (C) 18
  (D) 24
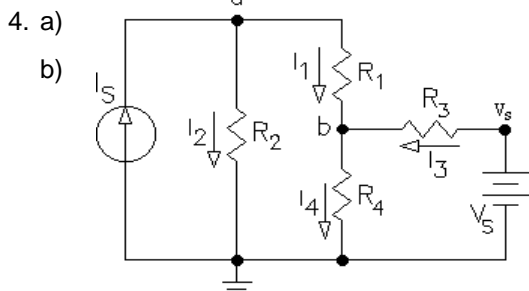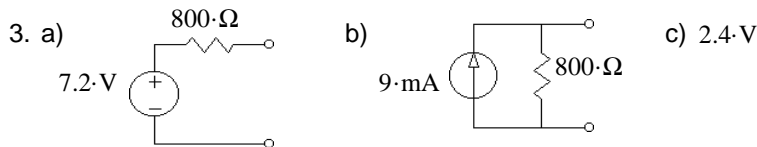 (E) 27

36A I_2 I_1 10Ω   10Ω   20Ω   20Ω

d) The voltage across the 50-ohm resistor in the circuit shown is most nearly:

  (A) 0.95 V
  (B) 2.4   V
  (C) 5.95 V
  (D) 8.33 V
  (E) 14.3 V

10·Ω   20·Ω   35·V   25·V   30·Ω   50·Ω   100·Ω

Answers

1. a) 25·Ω   b) 8.3·V   c) 498·mW

2. - 1.5·mA   18·V

3. a) 800·Ω   7.2·V   b) 9·mA   800·Ω   c) 2.4·V

4. a)

b) I_S I_2 R_2 b R_1 R_3 V_s I_3 I_4 R_4 V_S a

c) 2

d) node a: $I_S = \dfrac{V_a - 0}{R_2} + \dfrac{V_a - V_b}{R_1}$

  node b: $\dfrac{V_a - V_b}{R_1} + \dfrac{V_s - V_b}{R_3} = \dfrac{V_b - 0}{R_4}$

5. a) (D)   b) (D)   c) (D)   d) (B)