

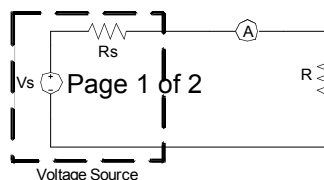
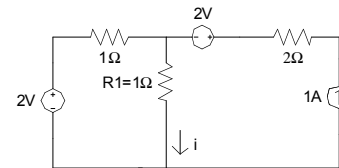
EECS 40, Fall 2007
Prof. Chang-Hasnain

Homework #2

Due at 5 pm in 240 Cory on Wednesday, 9/12/07
 Total Points: 100

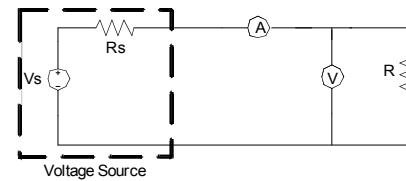
- Put (1) your name and (2) discussion section number on your homework.
 - You need to put down all the derivation steps to obtain full credits of the problems. Numerical answers alone will at best receive low percentage partial credits.
 - No late submission will be accepted expect those with prior approval from Prof. Chang-Hasnain.
 - Problems of this HW are from Hambley 4th Edition
1. P2.50 (Node-Voltage Analysis) (8 points) Just writing a system of equations in standard form is sufficient—you don't need to solve them.
 2. P2.60 (Node-Voltage Analysis with dependent source) (10 points)
 3. P2.62 (Mesh-Current Analysis) (10 points). Just writing a system of equations in standard form is sufficient—you don't need to solve them.
 4. Circuit with many sources (Superposition, Power) (9 points)
 - a) Use superposition to find the current i . (7 points)
 - b) How much power does $R1$ absorb? (2 points)
 5. P2.79 (Thevenin & Norton equivalent) (12 points)
 6. P2.83 (Thevenin & Norton equivalent with dependent source) (14 points)
 7. P2.103 (Wheatstone Bridge) (2 points)
 8. P2.104 (Wheatstone Bridge) (10 points)
 9. P1.24 (Power & Energy) (5 points)
 10. Measuring Power (20 points)

Consider the following circuit in which you want to calculate the power absorption of resistor R .

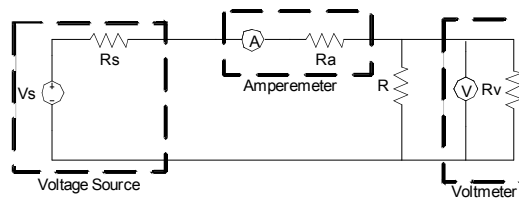


- a) Assume you do not know the exact values of R_s and V_s but R is known to be 10Ω . The ideal amperemeter measures a current of $1\mu\text{A}$. What is power absorption of R ? (2 points)

- b) For the following, R will be considered unknown. To measure the power absorption, we add an ideal voltmeter to the circuit. The voltmeter measures 5V and the amperemeter measures $4\mu\text{A}$. What power is absorbed by the resistor? (2 points)



- c) Now, neither the amperemeter nor the voltmeter are ideal any longer. The amperemeter can be modeled as an ideal amperemeter in series with resistor R_A , the voltmeter as an ideal voltmeter in parallel with resistor R_V . Therefore, we get the following circuit:



The power absorption of R will change slightly due to the addition of the two new resistors. Suppose we do not mind this effect, but do wish to correctly compute the (new) power absorption. Which of the measuring instruments does not measure the right value for calculating the (new) power absorption of R ? Why? (4 points)

- d) Under the assumption that you know R and R_V , can you correct the discrepancy? How? (7 points)
- e) Rearrange the measurement setup so that the measuring instrument you found in c) to measure the wrong value is now measuring the right quantity. What is the problem of this setup? (5 points)