

Your Name:
Perm#:

ECE 2A–Spring 2007
Prof. K. Banerjee

University of California, Santa Barbara
Department of Electrical and Computer Engineering

MIDTERM EXAMINATION

Room 1111 North Hall, May 9, 3:30-4:45 PM
(Lecture notes and text book allowed. Calculators OK)

Include all your answers in locations specified on these pages. Show **ALL WORKING** used to arrive at answers. Use space provided for all working. Use the back sides if necessary. There are **8 pages** including the cover page and two intentional blank pages. Be sure to write Your **NAME/Perm#** on **EVERY PAGE**.

Question	Scores
#1	/20
#2	/25
#3	/30
#4	/25
TOTAL	/100

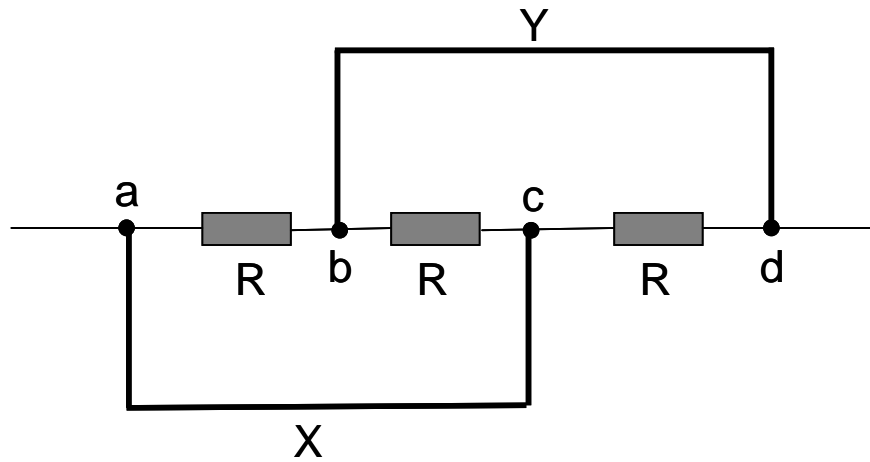
Good Luck!

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1. (20 points) This question has two different parts.

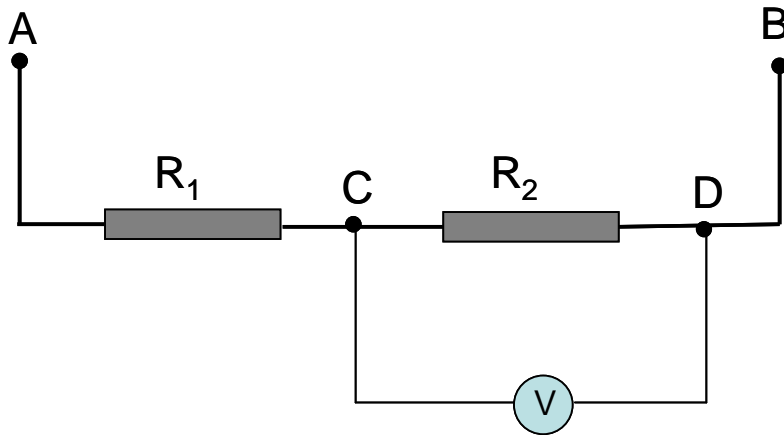
(a) (10 pts) What is the effective resistance across points i) "a" and "d" in the circuit shown below? Disregard the resistance of the connecting wires "aXc" and "bYd".



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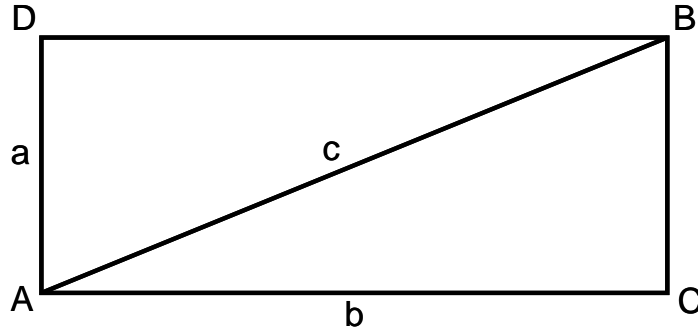
(b) (10 pts) Resistances R_1 and R_2 , each $60\ \Omega$, are connected in series. The potential difference between points A and B is $U = 120\ \text{V}$. Find the reading U_1 in the voltmeter connected across points C and D if its internal resistance $r = 120\ \Omega$.



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2. (25 points) Wires of identical cross-section (A) and resistivity (ρ) are soldered into a rectangle $ADBC$, as shown below, with the diagonal AB of the same cross-section and material. Find the resistance between i) points A and B , and ii) points C and D . The lengths of the sides $AD=BC=a$, $AC=BD=b$, and $AB=c$. Express your answers only in terms of a , b , A and ρ .



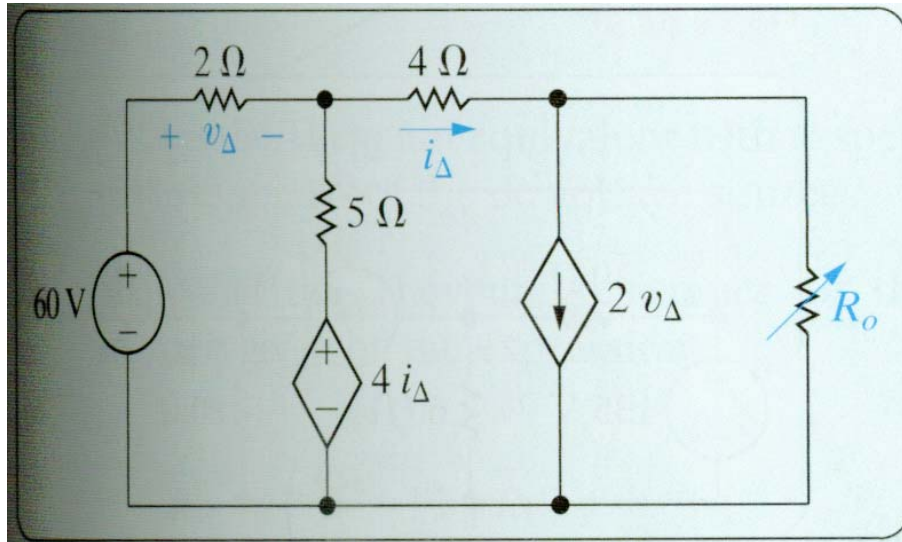
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3. (30 points) The variable resistor R_0 in the circuit shown below is adjusted until it absorbs maximum power from the circuit.
- Find the value of R_0
 - Find the maximum power
 - Find the percentage of the total power developed in the circuit that is delivered to R_0



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4. (25 points) Select the values of R_b and R_f in the circuit shown below so that:
 $v_o = 2000 (i_b - i_a)$. Assume that the OP-AMP is ideal.

