

FA'05

ECE 110
Professors Brunet and Trick

September 19, 2005

HOUR EXAMINATION #1

Last Name (use capital letters): _____

First Name (use capital letters): _____

Signature: _____

Circle your section: BL1(1pm)-Brunet

AL1(3pm)-Trick

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD

Problem	Value	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

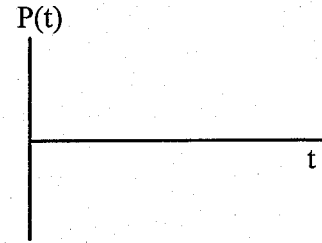
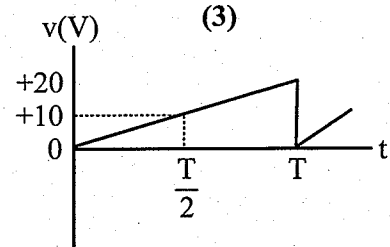
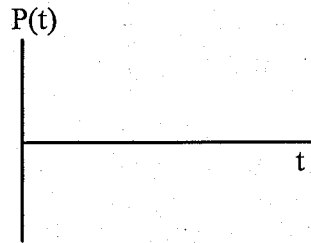
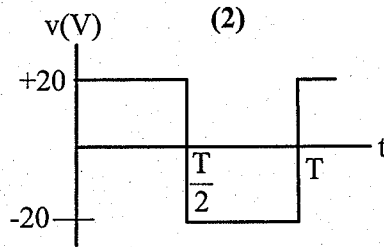
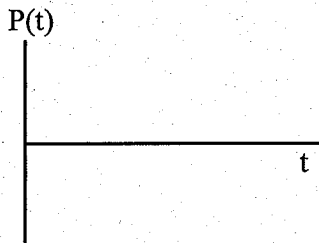
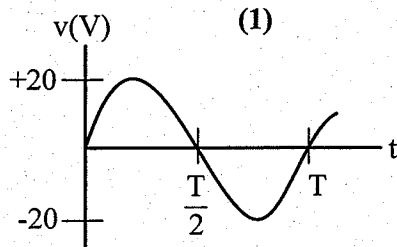
A. Write or print clearly. Answer each problem on the exam itself. If you need extra paper, there is an extra sheet at the end of this exam. Clearly identify the problem number on any additional pages.

B. In order to receive partial or full credit, **you must show all your work**, e.g., your solution process, the equation(s) that you use, the values of the variables used in the equation(s), etc. You must also include the unit of measurement in each answer.

Students caught cheating on this exam will earn a grade of F for the entire course. Other penalties may include suspension and/or dismissal from the university.

Problem 1 (20 points)

Below three periodic voltage waveforms are drawn. Sketch the instantaneous power in each case if these voltages are applied to a $10\ \Omega$ resistor. Clearly label the graphs and estimate P_{avg} in each case. It is not necessary to evaluate integrals. From your estimate of P_{avg} , calculate the rms value of the voltage in each case. Show your work!



$P_{avg} =$

$P_{avg} =$

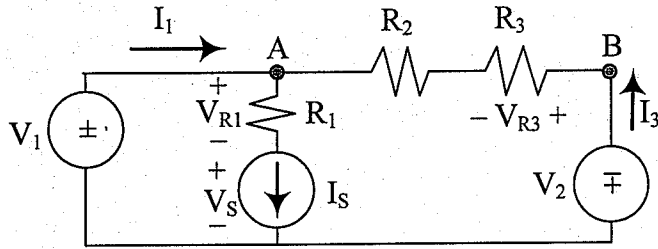
$P_{avg} =$

$V_{rms} =$

$V_{rms} =$

$V_{rms} =$

Problem 2 (20 points)



This problem has no numerical value.
In your final answer to each part only use the circuit parameters (among V_1 , V_2 , I_S , R_1 , R_2 , R_3). Show your work.

a) (4 pts.) Use KVL to find an expression for V_{AB} (in terms of the parameters!).

$$V_{AB} =$$

b) (4 pts.) Use the voltage divider rule to find an expression for V_{R3} (use part a)).

$$V_{R3} =$$

c) (4 pts.) Find an expression for I_3 (use part b)).

$$I_3 =$$

d) (4 pts.) Find an expression for I_1 (use part c)).

$$I_1 =$$

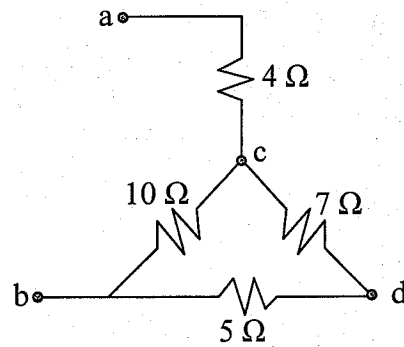
e) (4 pts.) Find an expression for V_S (you do not need the previous parts for this question).

$$V_S =$$

Problem 3 (20 points)

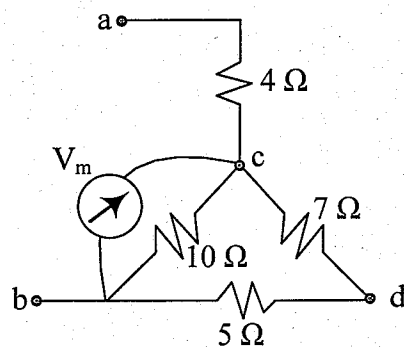
Find the equivalent resistance between terminals a-b in the following three cases. Show your work!

a)



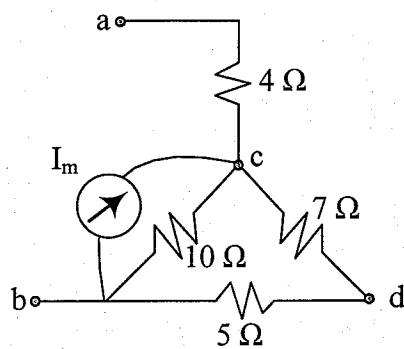
Req =

b) An ideal voltmeter is connected between nodes c-b as shown.



Req =

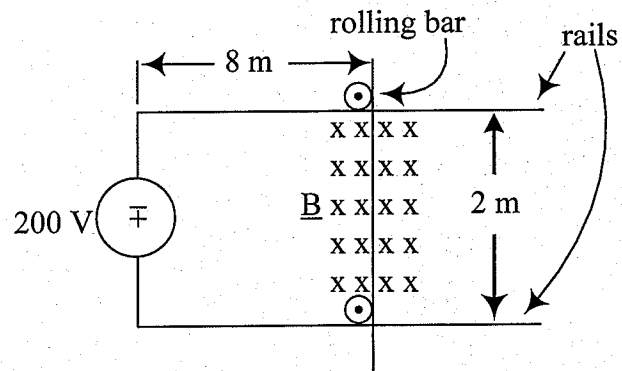
c) An ideal ammeter is connected between nodes c-b as shown.



Req =

Problem 4 (20 points)

In the figure the rolling bar makes electrical contact to two rails completing the electrical circuit. The resistance of the circuit is $5\ \Omega$ and $B = 0.3\ \text{T}$.



a) The direction of the force on the bar is (circle one):

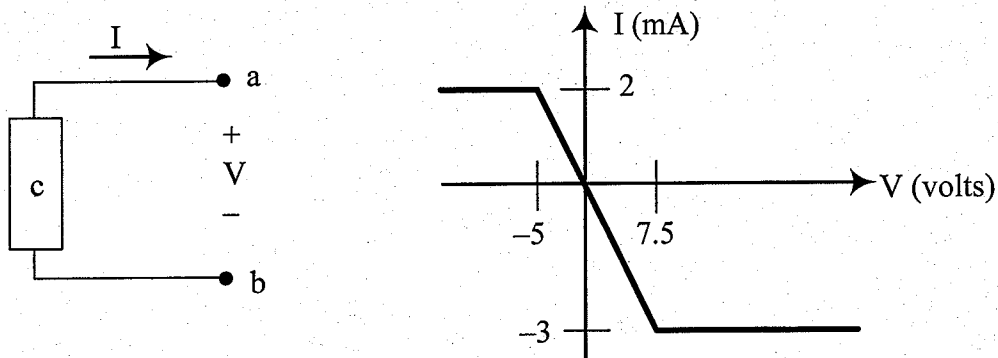
down right left up zero

b) The magnitude of the force on the bar is

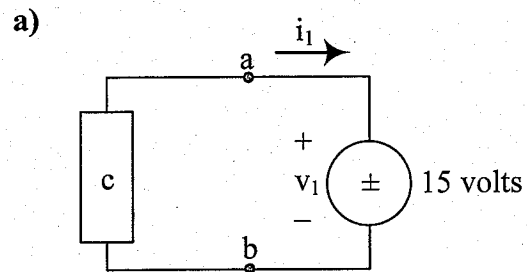
F =

Problem 5 (20 points)

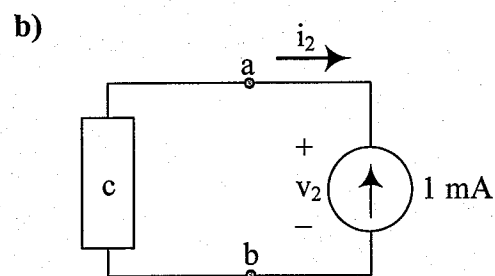
Consider the circuit below and its IV graph.



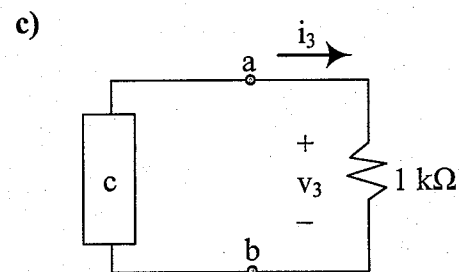
Find all the values of the current and voltage if the circuit is connected as shown in the three cases below. Show work for all answers. (Briefly explain how the values were found.)



$$i_1 = \boxed{} \quad v_1 = \boxed{}$$



$$i_2 = \boxed{} \quad v_2 = \boxed{}$$



$$i_3 = \boxed{} \quad v_3 = \boxed{}$$