NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ECE 111**

**EXAM 1**

**Fall 2014**

FOR GRADERS’ USE ONLY.

|  |  |  |
| --- | --- | --- |
| PROBLEM # | GRADE | POINTS |
| 1 |  | 24 |
| 2 |  | 20 |
| 3 |  | 20 |
| 4 |  | 70 |
| TOTAL |  | 134 |

1. (24 points total)

Given simple circuit elements with voltages across and currents through them as shown below, what power are they dissipating? Be sure to follow the Passive Sign Convention.

A. (6 points)

 PA = \_+(20mA)(3V)=+60 mW\_\_\_\_\_\_\_\_

B. (6 points)

 PB = \_-(2mA)(8V)=-16mW\_\_\_\_\_\_\_\_\_\_\_

C. (6 points)

 PC = \_+(-6A)(-3V)=+18W\_\_\_\_\_\_\_\_\_\_\_

1. (6 points)

 PD = \_-(4mA)(3V)=-12mW\_\_\_\_\_\_\_\_\_\_

2. (20 points total)

Given the circuits below:

1. (10 points) Find the voltages V1 and V2:







V1=\_\_\_\_\_8V\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

V2=\_\_\_\_\_2V\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. (10 points) Find the currents I1 and I2







3. (20 Points Total)

A.) (10 points) Given this Practical Voltage Source:



What is its equivalent Practical Current Source?



B. (10 points) Given this Practical Current Source:



What is its Equivalent Practical Voltage Source?



4. (70 points total)

Given the circuit below, use Node-Voltage Analysis to find Vo, the voltage across the 5kΩ resistor on the right side.



A.) (6 points) Label the nodes on the diagram and designate one as reference.

**Label A, B, C, and D. D is reference**

B.) (4 points) Write the desired result in terms of the Node Voltages.

**VO=Vc**

C.) (4 points) Are any Supernodes required? If so, which nodes are included?

**Yes, B&C make a Supernode, Vb-Vc=5V.**

**Can also say A and D make a supernode that includes the Reference, Va=9V.**

D.) (20 points) Write the Node and Supernode equations needed and reduce .



E.) (20 points) Find VO. (Be sure to draw a box around your answer.)



OR: Write as Matrix and use Cramer’s Rule



Then:



F.) (16 points) Call the power dissipated by the horizontal 10kΩ resistor on the left P1, the power dissipated by the vertical 10kΩ resistor near the center P2, and the power dissipated by the 5kΩ resistor on the right P3. Find the values of P1, P2, and P3:



P1 = \_\_\_1.8mW\_\_\_\_\_\_\_\_\_\_\_\_\_ P2 = \_\_\_2.26mW\_\_\_\_\_\_\_\_\_\_ P3 = \_\_\_12.5µW\_\_\_\_\_\_\_\_\_\_\_