Electric Circuits ECSE 2010

1) General Current, Voltage, or Power

The plot below is the net positve charge flowing in a wire vs. time. Sketch the corresponding current during the same period of time.



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2) Source devices and Total Power



2.3: Determine the power supplied/consumed by each component and show they balance to 0W.

3) Nodal voltages/voltage drops/currents



3.1: How many nodes are in the above circuit?

3.2: Determine the voltage at every node.

3.3: Determine the current through R3, V2, and V3 (label or indicate current direction for full credit)

4) KVL/KCL

In this circuit,

4.1: Determine four linearly independent equations for the voltage across the resistors. You will have to use a combination of Ohm's law, KCL, and KVL.

Redraw the circuit with polarities for full credit.



4.2: Set up these equations in matrix/vector form.

4.3: Solve for the voltages across each resistor.

5) KVL/KCL



In the above circuit,

5.1: Determine five linearly independent equations for the voltage across the resistors. You will have to use a combination of Ohm's Law, KCL, and KVL.

5.2: Set up these equations in matrix/vector form.

5.3: Solve for the currents through each resistor. Use some software like Maple or Matlab or online tools.

t := 0, 1..6

 $q(t) := if \big(t \le 2, 10 + 10 \cdot t, if \big(t \le 3, -5t + 5, if \big(t \le 4, -5t + 5, if \big(t \le 5, -5t + 5, if \big(t \le 6, 5t, 0 \big) \big) \big) \big)$