University of Alabama, Huntsville  
Department of Electrical and Computer Engineering

EE 300: Electrical Circuits I  
Examination I  
Professor Jennifer English  
Fall Semester 2001

This exam is closed book and closed notes. One 3”X5” piece of paper with handwritten notes on one side only is permitted. Calculators are also permitted to perform mathematical operations and matrix operations, but no other programmable feature is to be used. The exam consists of 3 problems. The point values for each problem are given. The problems are not necessarily equally difficult, so you are encouraged to read the entire examination before starting and begin with the problem you find the easiest. The examination is worth a total of 100 points. Partial credit will be given for each problem; however, work must be legible and logical to receive credit. Remember to give applicable units with each answer.

Please do all your work on this examination paper. If more room is required or you wish to do scratch work, please use the reverse side of a sheet. Remember, partial credit cannot be given if you do your work on a piece of paper you don’t hand in!

Please place your name on the top of each examination page.

In the interest of academic honesty, please read the following statement and write your signature below.

On my honor, I have neither given help to anyone on this examination, nor received help from anyone on this examination.

Signed____________________________________
1. [35 points] Use **nodal analysis** to solve the following circuit:

(a) [10 points] Label the reference node and the node voltages in the circuit. Using these, write down the expressions for the current $I_x$ and the voltage $V_o$. 
1. continued.

(b) [20 points] Write the nodal equations and solve for the node voltages.

(c) [5 points] Solve for the current $I_x$ and the voltage $V_o$. 
2. [35 points] Consider the following circuit, noting that mesh currents have been labeled with their directions:

(a) [10 points] In terms of the mesh currents labeled, write expressions for the voltages, $V_X$ and $V_o$, and the current $I_Y$. 
(b) [5 points] Look at the circuit and in terms of the mesh currents, write down all the things that are known besides those expressions from part a.

(c) [20 points] Write down the five mesh equations. Note you don’t have to solve these expressions.
3. [30 points] Consider the following circuit system which consists of a driving source and a resistive load:

(a) [15 points] The load is a resistor network that can be simplified to an equivalent resistance. What is this equivalent resistance?
(b) [15 points] Consider the following circuit, which consists of an unknown source and a resistive load. A multi-meter was used to measure the equivalent resistance of the load. This equivalent resistance is 20 $\Omega$. The load is required to absorb exactly 200 W of power. You are to design a source such that the load receives the correct amount of power. The sources given on the following page are to be used to design this source. You may use any combination of these sources, but you may only use each source once.
Choices of sources: