Instructions

WRITE CLEARLY and NEATLY. Messy and illegible writing will result in ZERO credit.

1. Examination Duration: 1 hour 15 minutes. If you come early (up to 15 minutes), you can have that extra time.

2. You can use a calculator, and the Help Sheet that has been verified by the instructor.

3. There are 3 parts, A, B and Bonus. Part A: 40 points – 3 problems, equally weighted, Part B: 60 points - 3 problems, equally weighted, and Bonus – 1 problem, 10 points. DO NOT RELY ON PARTIAL CREDITS, which will be given only for proper steps/logic, and solely at the discretion of the instructor. SHOW ALL YOUR STEPS. Highlight your answers.

4. Answer in the space/sheets provided. Additional sheets are provided at the end for scratch work and/or for space needs. Do not un-staple; if you do, staple back with page numbers in order.

5. Any copying or cheating will result in appropriate action as per university regulations.

Score Tabulation (For Grading Purposes by the Instructor)

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<td>B1</td>
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<td>Bonus</td>
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A.1

Determine the power delivered or absorbed by the 4V voltage source in the following circuit. You must clearly say whether power is absorbed or delivered to get credit.
A.2
Use $\Delta$-Y or Y-$\Delta$ transformation as appropriate to determine the voltage $v_2$. 

![Circuit Diagram]

- 24 V
- $v_1$
- $v_2$
- 40 $\Omega$
- 1 $\Omega$
- 10 $\Omega$
- 50 $\Omega$
- 15 $\Omega$
A3
Use a series of source transformation as appropriate to determine the current $i_o$. 

[Diagram of electrical circuit with labels and values]
B1 (Mesh current analysis)

Using mesh current analysis, determine the mesh currents $i_1$, $i_2$, $i_3$ and the branch current $i_0$. You must clearly show the mesh equations, including any constraint equations for appropriate credit. Clearly mark or show any super mesh(es) that you identify and use.
B2 (Node voltage analysis)
Using node voltage analysis determine the node voltages $v_k$, $k=1,2,3$. You must clearly show the node equations, including any constraint equations for appropriate credit. Clearly mark or show any super node(s) that you identify and use.
B3. (The’venin Equivalent)
Find the The’venin equivalent to the left of the terminals “a” and “b” (15 points). Determine the power dissipated in the 100Ω resistor. (5 points)
C. **Bonus (10 points) (Superposition)**

Determine the voltage $v$ by applying the principle of superposition.