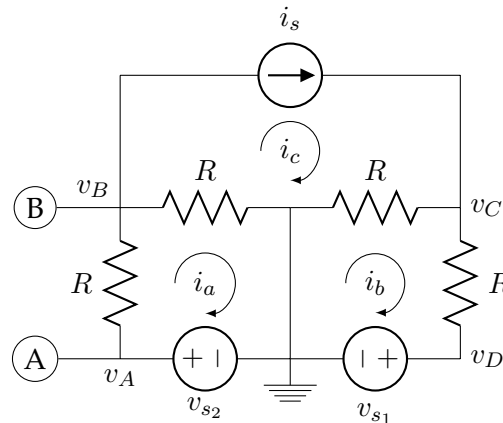


MAE140 - Linear Circuits - Fall 2019
Midterm, October 24th

Instructions

1. This exam is open book. You may use whatever written materials you choose, including your class notes and textbook. You may use a hand calculator with no communication capabilities.
2. You have 70 minutes.
3. Write your answers on your “Blue Book”.
4. Do not forget to write your name, student number, and instructor.
5. This exam has 2 questions, for a total of 22 points.



1. Systematic Circuit Analysis

- (a) (6 points) Formulate either node-voltage or mesh-current equations for the circuit above. Use the node-voltages, mesh-currents and labels provided in the figure and clearly indicate the final equations and circuit variable unknowns. Make sure your final equations involve only node-voltages or mesh-currents. You do not need to solve any equations.
- (b) (2 points) Explain how one could solve for the voltage across the current source i_s in terms of the indicated mesh-currents.
- (c) (2 points) Explain how one could solve for the current through the voltage source v_{s1} in terms of the indicated node-voltages.

2. Linearity and Equivalent Circuits

- (a) (6 points) Draw diagrams for the three circuits resulting from setting all sources in the above circuit to zero then turning each one of them on, one at a time.
- (b) (4 points) Use linearity and superposition to calculate the voltage difference $v_B - v_A$ using the circuits you obtained in part (a). Clearly show how you solve each circuit and the final expression for $v_B - v_A$.
- (c) (2 points) Calculate the Thevenin equivalent of the above circuit as seen from the terminals (A) – (B).
Hint: Use the solution from part (b).