Thevenin & Op Amp Practice

EGR 220, Chapters 4 & 5
February 23, 2016

Overview

- Practice problems
- Thevenin Equivalents
- Op Amps

Lab Memo Feedback

- Engineering/Scientific experiments
  - Text of the lab is limited to 1 page
  - Include data and calculations as short, ½ page appendices (for example)
- Final statement
  - Go beyond what is in the lab handout
  - Have your own thoughts/questions/observations, etc. to demonstrate your thinking and learning.

- Find $i_x$ using Thevenin’s Theorem for terminals α-b
- What if $I_s = 2A$?
• Find $V_o$ using Thevenin’s Theorem

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### Thevenin Self-Review

• What is a Thevenin Equivalent Circuit?
  o Draw a generic Thevenin equivalent circuit
  o Discuss and write down 3 good uses for a Thevenin equivalent circuit, or for the Thevenin theorem

• How might you find the maximum power that can be delivered to any load from any circuit?
  o Why is this an important question?

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### Op Amp Equivalent Circuit Diagram

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### Op Amps Do Math: Difference Amplifier → find $v_o$ and $i_o$
• Find $v_o$ and $i_o$.

![Circuit Diagram](image1)

• Find the ratio $v_o / i_o$.
• Evaluate this expression for $R_1 = 20\, \text{k}\Omega$, $R_2 = 25\, \text{k}\Omega$, and $R_3 = 40\, \text{k}\Omega$.

![Circuit Diagram](image2)

• Find $v_o$.

![Circuit Diagram](image3)

• Find $i_o$.

![Circuit Diagram](image4)
Lab 4 Pre-Lab

- This is a LONG lab
- You must complete the pre-lab and this week it will be ‘graded’ as correct or incorrect
  - Wiring diagrams
    - Something possible that shows you are thinking about this
  - Gain & output expressions – correct or not
  - Sketch of output – correct or not

Summary

- Uses for op amps
  - Amplifying an electrical signal
  - Basic math functions – analog computers
- Analysis with op amps uses:
  - The Golden Rules
  - Often use: KCL and/or Voltage-divider
- Concepts of gain and feedback