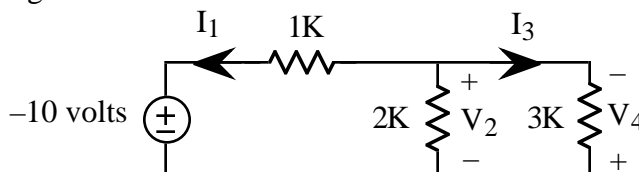


PROBLEMS YOU SHOULD BE ABLE TO DO AFTER YOU COMPLETE ECE 109

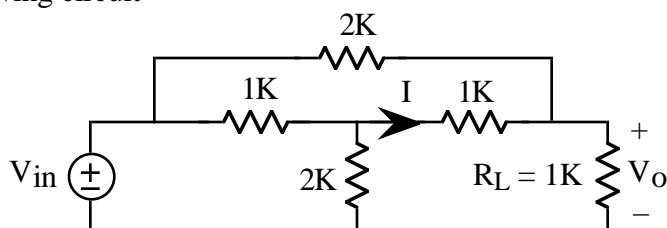
FALL 1995

A.P. FELZER

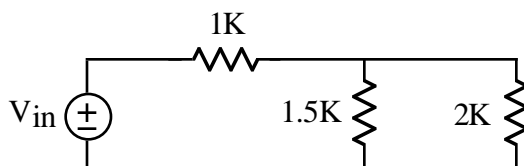
1. Explain how to analyze resistor circuits with node equations. What's an advantage of using node equations
2. Given the following circuit



- a. Find I_1 , V_2 , I_3 and V_4
- b. Explain how the choice of reference directions affects
 - (i) What's going on inside the circuit
 - (ii) The values of the voltages and currents
3. Given the following circuit

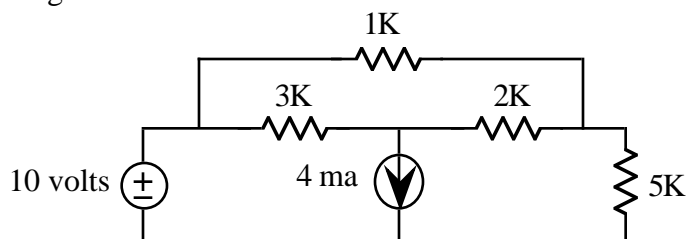


- a. Write and put in matrix the node equations
- b. Solve your equations in part (a) for the node voltages and then use the results to calculate I for $V_{in} = 5$ volts
- c. Find the power being supplied by the source V_{in} and the power being received by the load R_L if $V_{in} = 5$ volts
- d. Find R_{eq} as seen by the source V_{in}
- e. Find the transfer function $G = V_O/V_{in}$. Then make use of your result to find V_O if $V_{in} = 5$ volts. Make sure you get the same result as in part (b)
- f. Find and draw the Thevenin Equivalent as seen by R_L if $V_{in} = 5$ volts
- g. Make use of your Thevenin Equivalent circuit in part (f) to find V_O . Make sure you get the same results as in parts (b) and (e)
- h. Make use of SPICE to check your result for V_O
4. Which resistor will burn out first in the following circuit as V_{in} is increased

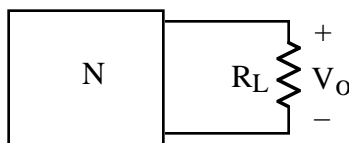


Assume that all the resistors are the same wattage. Explain how you got your answer

5. Given the following circuit

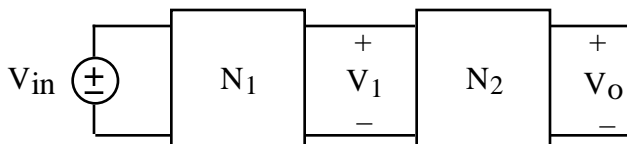


- Calculate the total amount of power being supplied by the sources
 - Check your answer in part (a) with results from SPICE
6. Given the following circuit



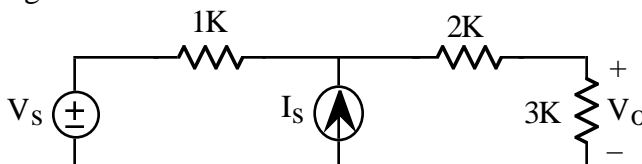
with open circuit voltage $V_{OC} = -10$ volts

- Sketch V_O as a function of R_L . Describe your curve. Then explain why it looks the way it does
 - Sketch V_O as a function of R_{TH} of N if $R_L = 1K$. Describe your curve. Then explain why it looks the way it does
7. Under what circumstances does the overall voltage gain $G = V_O/V_{in}$ of the following cascade circuit



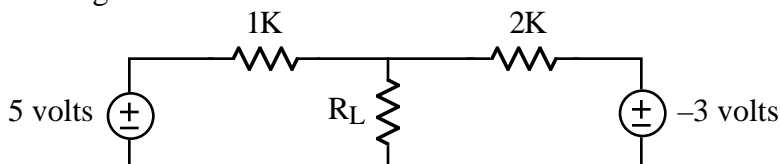
equal the product of the open circuit voltage gains of the individual sections. Explain why

8. Given the following circuit



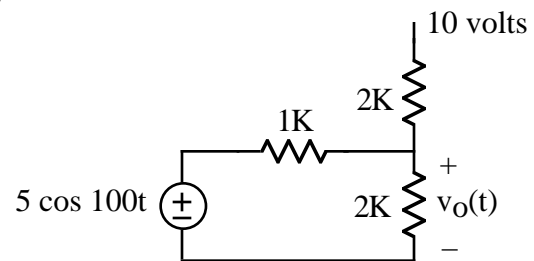
Find V_O as a function of V_S and I_S

9. Given the following circuit



- Sketch the power being delivered to R_L as a function of R_L
- For what value of R_L will most power be delivered

10. Given the following circuit



- Find and sketch $v_O(t)$
- Use SPICE to obtain a plot of $v_O(t)$