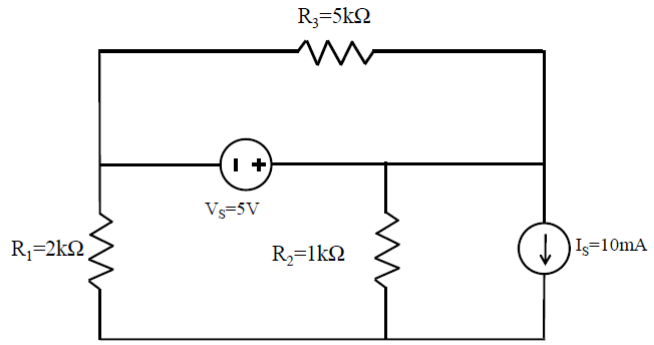
EEE 202 **Homework 1**

Q1.

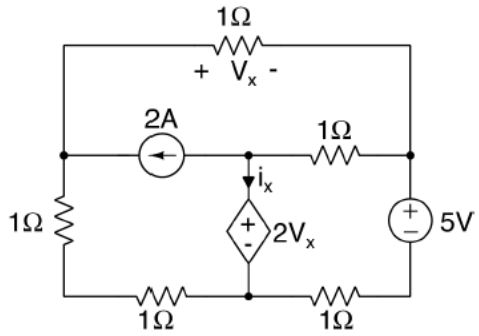


Find the powers of the voltage source (V_S) and current source (I_S) by following passive sign convention.

Are they supplying or absorbing power?

You can use a method of your choice for the circuit analysis.

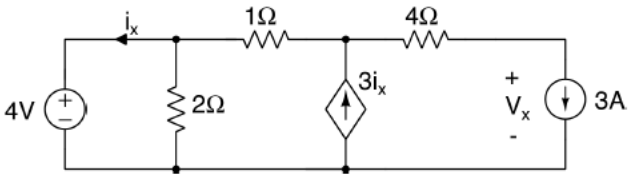
Q2.



a) Solve the circuit above using node analysis. Find node voltages. Also, find i_x and V_x.

b) Solve the circuit above using mesh analysis. Find mesh currents. Also, find i_x and V_x.

Q3.

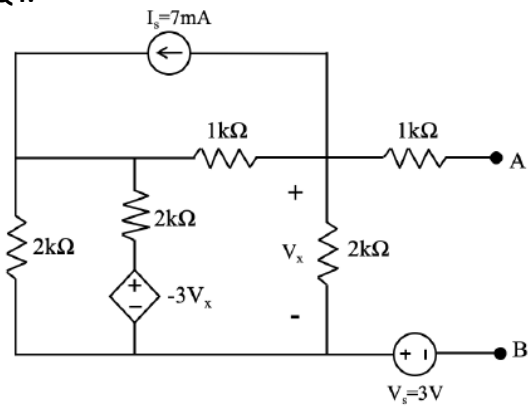


a) Find V_x using superposition.

b) Find the powers of all sources (including dependent sources). Are they supplying or receiving power?

c) Assume that 4V voltage source is replaced with 8V voltage source, and 3A current source is replaced with -5A current source. Find V_x.

Q4.



Find and draw the Thevenin equivalent circuit between the terminals A and B.

Q5. In the circuit below, nodes, mesh currents, and element voltages and currents are labeled. Also $R_1 = R_2 = R_3 = R_4 = 10k\Omega$.

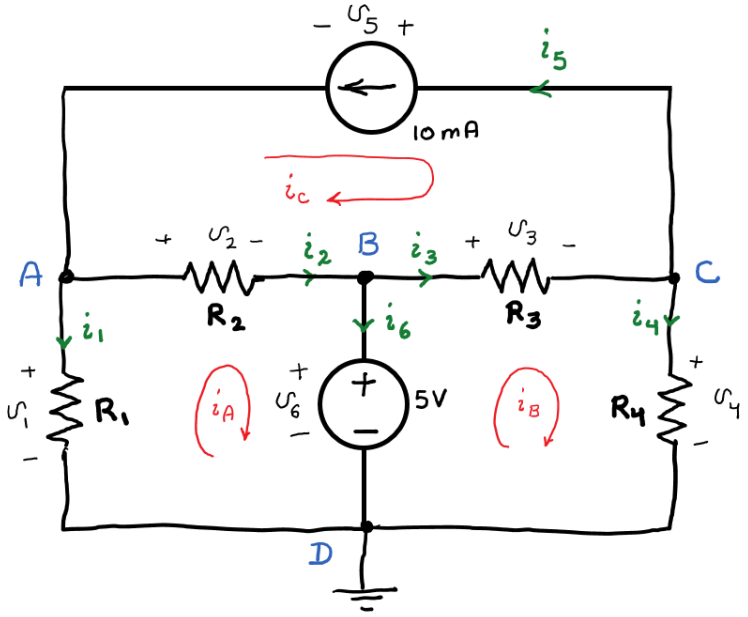
a) Determine n (number of nodes) and b (number of elements). Write n-1 KCL equations in terms of the element currents. Write b-n+1 KVL equations in terms of the element voltages. Write b element equations in terms of the element currents and voltages. Finally collect all of the equations in a single matrix equation $A \cdot x = b$ where $x = [v_1\ v_2\ v_3\ v_4\ v_5\ v_6\ i_1\ i_2\ i_3\ i_4\ i_5\ i_6]^T$. Solve the system using Matlab (or other) and find x.

b) Using node analysis solve for the node voltages V_A, V_B, and V_C. Using these, find v_5 and i_6, and compare them with the results you obtained in part "a".

c) Using mesh analysis solve for the mesh currents i_A, i_B, and i_C. Using these, find v_5 and i_6, and compare them with the results you obtained in part "a".

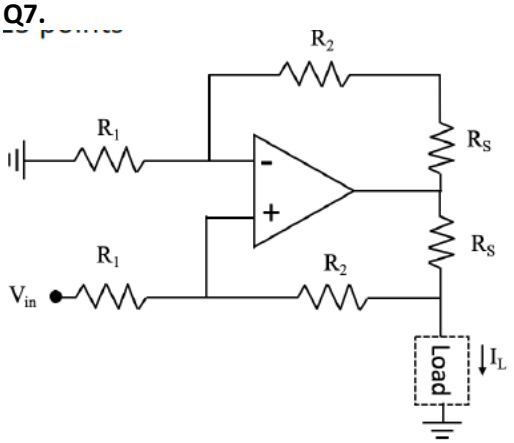
d) Finally find v_3 using superposition and compare with what you found in part "a".

e) Find the Thevenin and Norton equivalent circuits seen by R_3. Solve for v_3 again using the Thevenin equivalent circuit seen by R_3 and compare with what you have found in part "d".



Q6. Solve problem 3.49 from Thomas 8th edition.

Q7.



This OPAMP circuit is specially designed to act like a voltage controlled current source. It generates a current I_L that is independent of the load.

Find I_L in terms of V_{in} and resistor values. Assume ideal and linear OPAMP operation.