

EE 109 Homework 1¹

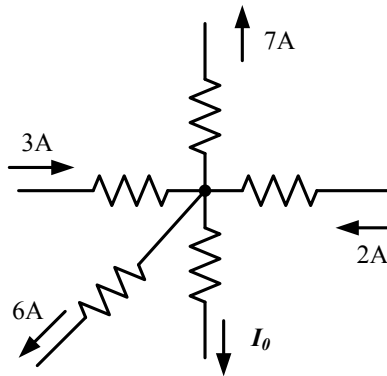
Name: _____

Due: See website

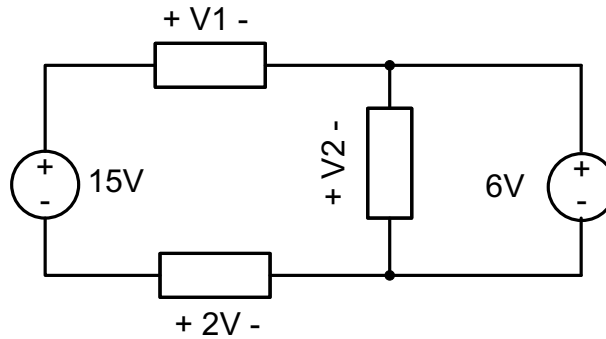
Score: _____

Neatly show your work to get full credit and clearly show your final answer.

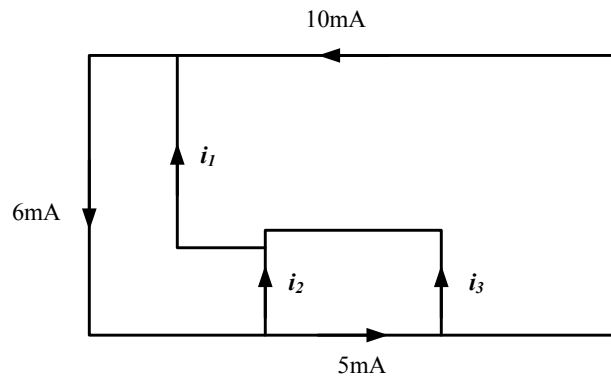
1.) [5 pts.] Use KCL to solve for I_0 .



2.) [8 pts.] Use KVL to solve for V_1 and V_2 .

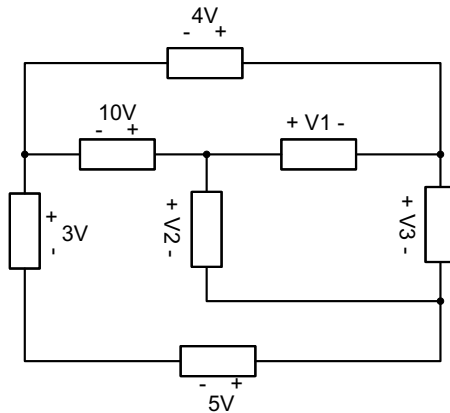


3.) [9 pts.] Solve for the currents i_1 , i_2 , i_3 .

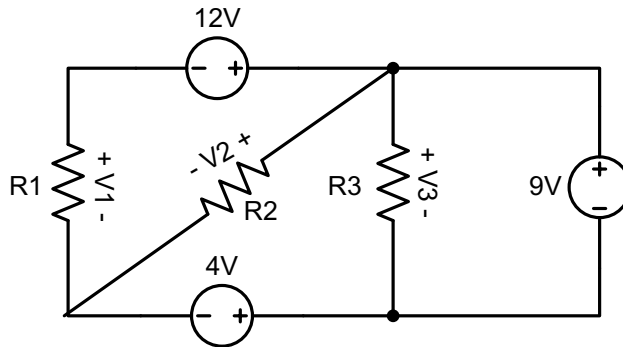


¹ Many of these exercises were derived or inspired from Fundamentals of Electric Circuits, 3rd ed. By Alexander, Sadiku. McGraw-Hill Publishers.

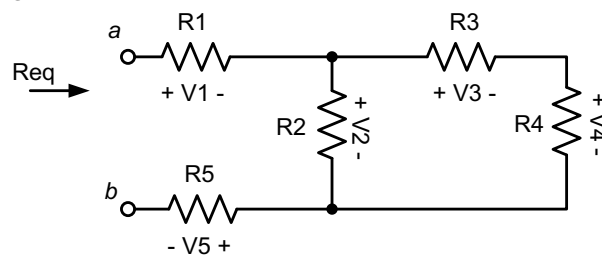
4.) [9 pts.] Solve for the voltages V_1 , V_2 , V_3



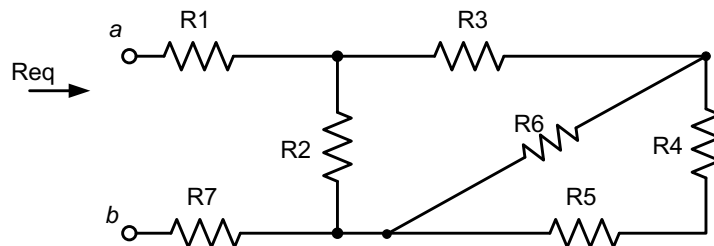
5.) [9 pts.] Solve for the voltages V_1 , V_2 , V_3 across the respective resistors.



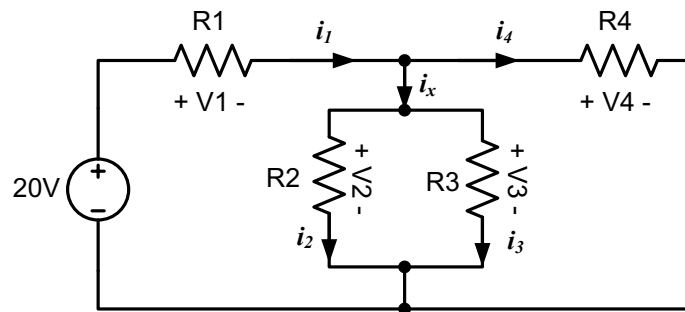
6.) [10 pts.] Reduce the resistor network shown below to a single equivalent resistance. Assume the values of the resistors are given as $R_1=3\Omega$, $R_2=4\Omega$, $R_3=2\Omega$, $R_4=2\Omega$, $R_5=1\Omega$.



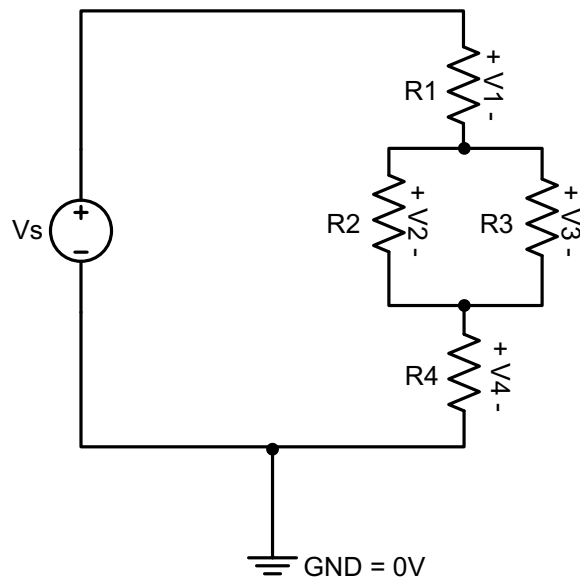
7.) [10 pts.] Reduce the resistor network shown below to a single equivalent resistance assuming the following resistor values: $R_1=5\Omega$, $R_2=4\Omega$, $R_3=3\Omega$, $R_4=1\Omega$, $R_5=1\Omega$, $R_6=2\Omega$, $R_7=7\Omega$.
Hint: Start by combining R_4 and R_5 then combine those with R_6 and keep going...



- 8.) [8 pts.] Find an expression for the current i_1 if $R_1=4\Omega$, $R_2=3\Omega$, $R_3=6\Omega$, $R_4=2\Omega$.
Hint: Combine R_2 , R_3 , R_4 into an equivalent resistance which will be in series with R_1 . From here you can use a KVL loop or Ohm's law to solve for i_1 .



- 9.) [16 pts.] Use the generalized concept of a voltage divider (review your notes/lecture slides) to find expressions for the voltage V_1 and also V_4 in the circuit below. Your expression should be in terms of V_s and R_1 - R_4 .



- 10.) [6 pts.] Look at the circuit from problem 9. If R_4 is very large (approaches infinity) what would V_4 be (approximately)? Your expression should be in terms of V_s and (possibly) some of R_1 - R_4 .
Hint: Use your equation from the previous problem and let R_4 go to infinity...
- 11.) [5 pts.] Look at the circuit from problem 9. If R_3 is very large (approaches infinity) again solve (approximately) for the voltage V_4 ? Your expression should be in terms of V_s and (possibly) some of R_1 - R_4 .
Hint: Use your equation from problem 9 and let R_3 go to infinity.
- 12.) [5 pts.] Look at the circuit from problem 9. If R_3 is effectively 0Ω (i.e. replaced by a wire), solve (approximately) for the voltage V_4 ? Your expression should be in terms of V_s and (possibly) some of R_1 - R_4 .