ENGR 2910-101: Circuit Analysis

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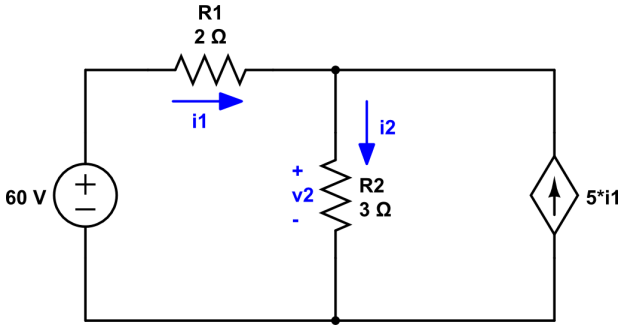
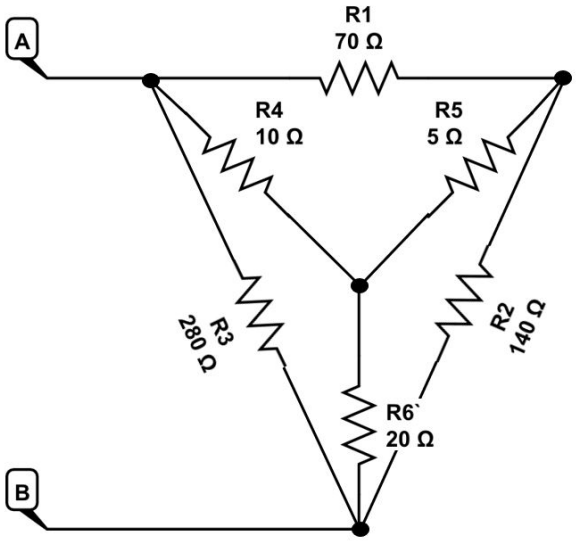
Midterm 1

Please show all your work and circle your answers to each question.

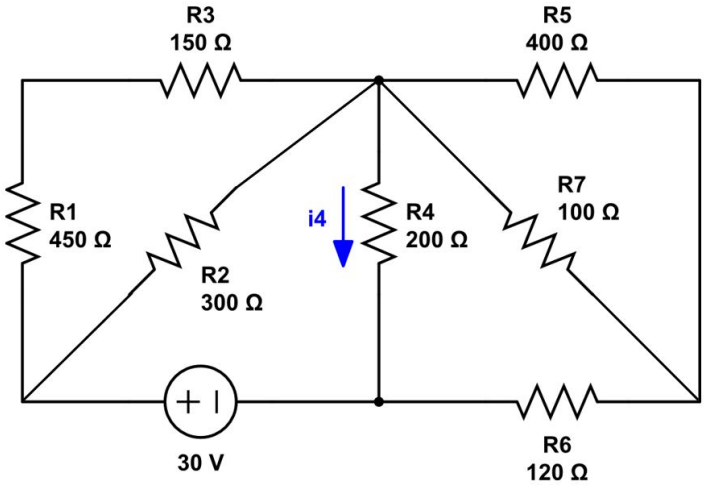
Question 1 [20]
What is the value of v_2?



Question 2 [20]
Using Y-to-Δ, find the equivalent resistance between A and B.



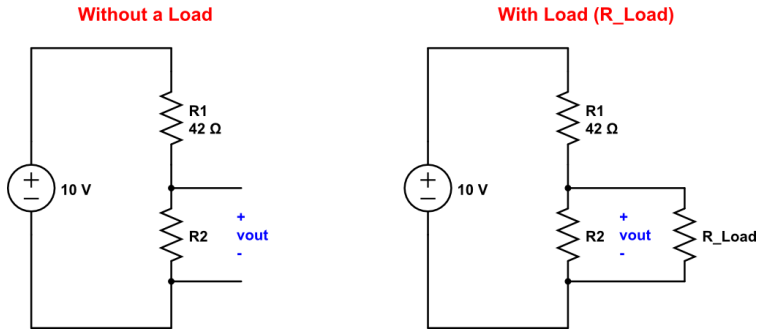
Question 3 [20]
For the below circuit:



(a) What is the equivalent resistance seen by the voltage source (30V)?

(b) What is the current i_4?

Question 4 [20]
Consider the voltage divider below (both with and without a load):



(a) Without a load, what value of R_2 will provide a v_{out} of $3V$?

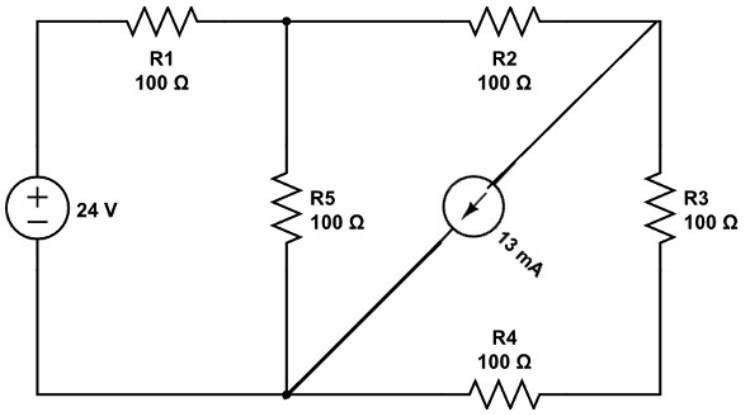
(b) If the load (R_{load}) has a resistance of 9Ω:

(i) For the R_2 calculated in (i), how does R_1 need to change to maintain proving $3V$ to the load?

(ii) How much Power is being absorbed by the load (R_{load})?

(iii) How much Power is being provided by the $10V$ source?

Question 5 [20]
For the following circuit:



(a) How many essential nodes (n_e)?

(b) Using the Node-Voltage method, find the required simultaneous equations.

(c) Write out the Node-Voltage Matrix, simplifying any fractions or converting to decimal (DO NOT SOLVE IT).

Extra Credit
In a wire, the moving charge is carried by electrons. This negative charge moves from lower to higher potential. However, by convention, current is defined as the movement of positive charge from higher to lower potential. Why do we use this convention?