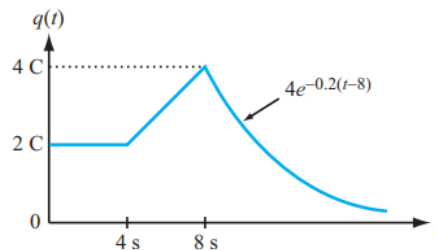


ECEN203 Analogue Electronics and Systems: Homework 1 (5%)

Attempt all 12 questions. Show your solution steps clearly. Submit individually on VUW submission system by the due date (check website). Total = 42 marks.

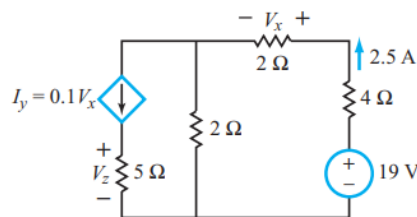
Q1. [2 marks] Determine the current $i(t)$ flowing through a certain device if the cumulative charge that has flowed through it up to time t is given by $q(t) = 1.7t[1 - e^{-1.2t}]nC$.

Q2. [2 marks] The plot below displays the cumulative amount of charges $q(t)$ that has exited a certain device up to time t . What is the current at $t = 12$ s.

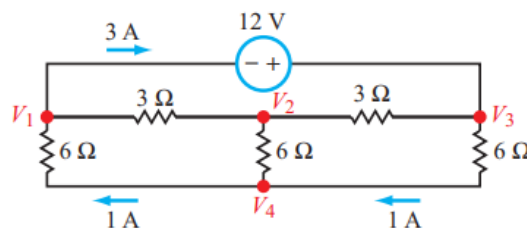


Q3. [4 marks] After $t = 0$, the current entering the positive terminal of a flashlight bulb is given by $i(t) = 2(1 - e^{-10t})$ (A), and the voltage across the bulb is $v(t) = 12e^{-10t}$ (V). Determine the maximum power level delivered to the flashlight.

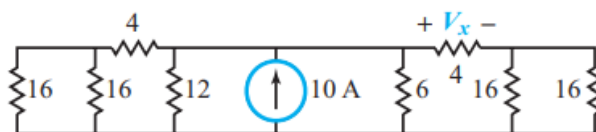
Q4. [2 marks] Determine V_z in the circuit below.



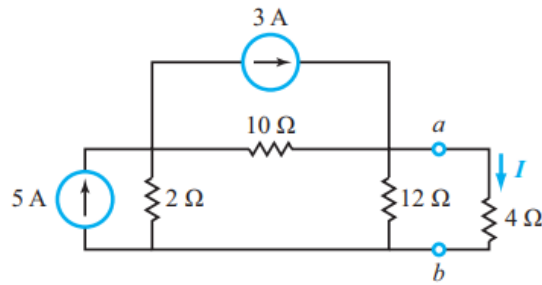
Q5. [3 marks] After assigning node V_4 in the circuit below as the ground node, determine node voltages V_1 , V_2 and V_3 .



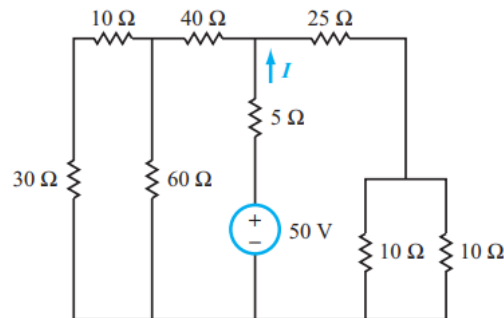
Q6. [3 marks] Use resistance reduction and source transformation to find V_x in the circuit below. All resistance values are in ohms.



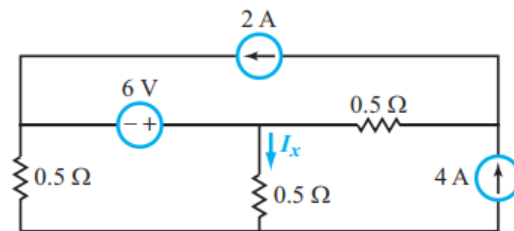
Q7. [3 marks] Apply source transformation and resistance reductions to simplify the circuit to the left of nodes (a, b) , as shown below, into a single voltage source and a resistor. Then, determine I .



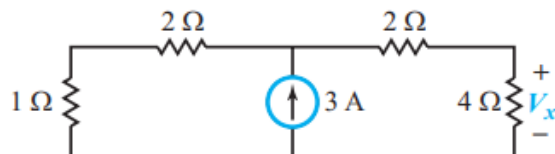
Q8. [3 marks] Determine the current I in the circuit below.



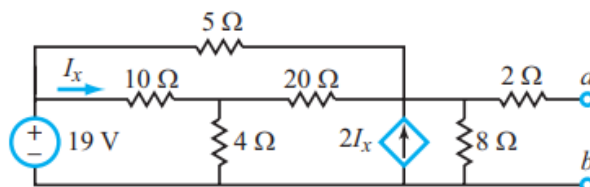
Q9. [4 marks] Use the supernode concept to find the current I_x in the circuit below. Indicate your supernode.



Q10. [4 marks] Use the supermesh concept to solve for V_x in the circuit below. Indicate your supermesh.



Q11. [6 marks] Find the Thevenin equivalent circuit at terminals (a, b) of the circuit below.



Q12. [6 marks] Find the Norton equivalent circuit of the circuit in Q11 after increasing the magnitude of the voltage source to 38 V.

~ End of Homework 1 ~